FLIGHT
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DIARY OF FORTHCOMING EVENTS

Club Secretaries and others desirous of announcing the dates of important fixtures are invited to send particulars for inclusion in this list :—

1927

Nov. 24 .... **"Modern Developments in Aircraft Instruments." Maj. C. J. Stewart, before R.Ae.S. and I.Ae.E.**

Nov. 29 .... **First Meeting of Associated Club's General Council, at Royal Ae.C.**

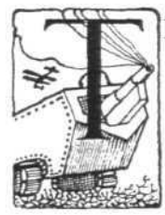
Dec. 1 .... **"The Problem of the Long Range Flying Boat." Maj. J. D. Rennie, before R.Ae.S. and I.Ae.E.**

Dec. 2 .... **No. 3 Sqdn. R.F.C. and No. 3 (Fighter) Sqdn., R.A.F. 4th Reunion Dinner, at Trocadero.**

Dec. 7 .... **"Air Power and its Application." Group-Capt. W. F. MacNeece Foster, Royal United Service Inst.**

Dec. 8 .... **"Fog." Capt. F. Entwistle, before R.Ae.S. and I.Ae.E.**

EDITORIAL COMMENT



THE third annual report of Imperial Airways, Limited, for the year ended March 31, 1927, has just been issued, and for the first time the accounts show a profit. Only a small one it is true, but still a profit. A net profit of £11,461 3*s.* 3*d.* is not, perhaps, a very impressive figure, but if one bears in mind that the previous year's accounts showed a loss of £20,414 19*s.* 8*d.*, the improvement becomes more worthy of note. In their report, the directors attribute this improvement to the European section of the lines operated by Imperial Airways, since the Middle East service during the first three months of its existence brought only negligible profits, as was to be expected. The first three months only of 1927 are included in the report, but it is stated that the financial results to date have been satisfactory on the desert route.

Commercial Aviation

It is pointed out in the directors' report that the accounts presented cover the first full year of operation with the multi-engined aeroplanes which were ordered in pursuance of the board's policy of creating as a first desideratum a goodwill based on safety and reliability. That this policy has been justified seems borne out by the statement that since January 1, 1925, Imperial Airways machines have carried 52,000 passengers and flown nearly 2½ million miles, without a single accident causing injury to passengers. That in all truth is a very commendable record, and makes up for a great many shortcomings in other directions. At the same time it would be well to bear in mind the fact that the present report covers only one year out of the three in which the company has been in existence, and that the whole of the credit for this happy immunity from accidents cannot in all fairness be given to the new three-engined types of machines. The older flying stock was in use during nearly two years previously, and, therefore, showed up as well in this respect as the new three-engined types. It is not that we wish to detract in the slightest from the latter type, but merely point out that even if the multi-engined machine has been proved good, the older types have not been proved bad, referring to qualities of safety only. Thus, it is not possible yet

to say definitely whether the multi-engined machine is likely to be the type of the future.

The report states that on the European services the traffic during the year in question increased by 26 per cent. compared with the previous year, and the trading revenue for these services by 39 per cent. Equating to a common basis the mileage flown by aircraft of different capacity and horsepower, the all-in cost of operation has decreased by 21 per cent. Whether this decrease in operational cost is due to the employment of the new three-engined machines, or to the greater amount of traffic diminishing the percentage of overhead charges, &c., for each machine-mile is not easy to determine. The new "horse-power-miles" basis may have had something to do with the subject.

In a letter accompanying the report, Sir Eric Geddes states that the company has reached a stage where their machines can now fly many more miles at a profit if the traffic can be attracted. This, presumably, means that whereas in the past the company has incurred a loss by flying more than the minimum mileage stipulated for subsidy purposes, the position now is that it is possible to make a profit when exceeding that figure; which looks as if one might now see some real progress in that the company has an incentive to seek an increase in the number of passengers and the quantity of mails and freight.

In a recent discussion, Mr. Handley Page criticised the subsidy basis, pointing out that the suggestion of "payment by results" of Lord Weir's Committee should have been followed, making the subsidy dependent upon the volume of traffic carried. Apparently, even with the much more indirect subsidy basis in force, it is still possible to make an increase in the traffic pay for itself.

The subject of new flying stock is, however, still a serious problem. A balance of reserve for obsolescence of £31,402 was in hand as at March 31, 1926, and to that has been added this year another £31,793, increasing the reserve for obsolescence to £63,195. Without exact figures it is difficult to know how many new machines this amount would purchase, but a rough estimate indicates that at most it would secure three new aeroplanes of the three-engined type to replace older machines. (In the discussion already referred to, Major Mayo suggested that what was wanted was an additional subsidy for the encouragement of the design of more efficient and economical aircraft types.) The "fleet" of the company is stated to comprise 20 machines, of which five are of 1,275 h.p. each (obviously De Havilland "Hercules-Jupiter" machines), four are of 1,188 h p (Armstrong-Whitworth "Argosy-Jaguars") three of 880 h.p. each, one of 845 h.p., three of 710 h.p. each, two of 440 h.p. each, and two of 240 h.p. each, giving a total of 18,102 h.p. for the entire fleet. The last four machines are single-engined types used, it is stated, "on special charters, etc." This fleet is valued in the report at £255,939 6s.

Only a brief reference is made to the Middle East desert route, but it is stated that since its inauguration at the end of 1926 it has operated over a route 1,100 miles in length with 100 per cent. regularity and reliability, the service being a fortnightly one at first, and later (in April, 1927) changed to a weekly one. The machines used on the desrt route, it will be recalled, are De Havilland "Hercules" with Bristol "Jupiter" engines. It was on one of these that the Secretary of State for Air flew to India.

Safety in the Air

At last the veil surrounding the new Handley Page automatic wing-tip slots has been lifted, and on Friday of last week a Bristol Fighter fitted with this device was officially demonstrated before the Secretary of State for Air, Sir Samuel Hoare, who made a flight in the machine, as did also later his wife, Lady Maud Hoare.

The new automatic slots are extremely simple mechanically, and add practically no weight to the machine. That they do what is claimed for them there can be no doubt after the demonstration, and it seems likely that in the near future a large number of machines will be fitted with the new safety device. We gather that a number of the Bristol Fighters which were to have been equipped with the older type of hand-operated slots will, instead, be provided with the latest automatic type, while certain newer types of service aircraft are also to be experimentally fitted. The accumulated experiences of all these tests should result in rapid progress, and on the civilian side we hear of various light 'planes that are about to be "slotted." Presumably at least one commercial aircraft will also be converted and thus join the "anti-spin league."

Exactly how far-reaching the results of Mr. Handley Page's invention or discovery are likely to be is difficult to say at the moment. Retaining control after stalling is not the whole problem, although it seems to go a long way towards that safety which is needed before flying can really come into its own. Descending with the machine horizontal at a speed of something like 20 m.p.h., even under perfect control, is still more than the average undercarriage can handle, and material breakages might be expected. It is, however, vastly to be preferred to diving into the ground at anything over 100 m.p.h., such as usuallly happens as a result of a spin near the ground. Even if the new slot were not to save many aeroplanes, it will undoubtedly save a large number of lives. And that would appear to be ample justification for its general adoption.

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A Severe Test

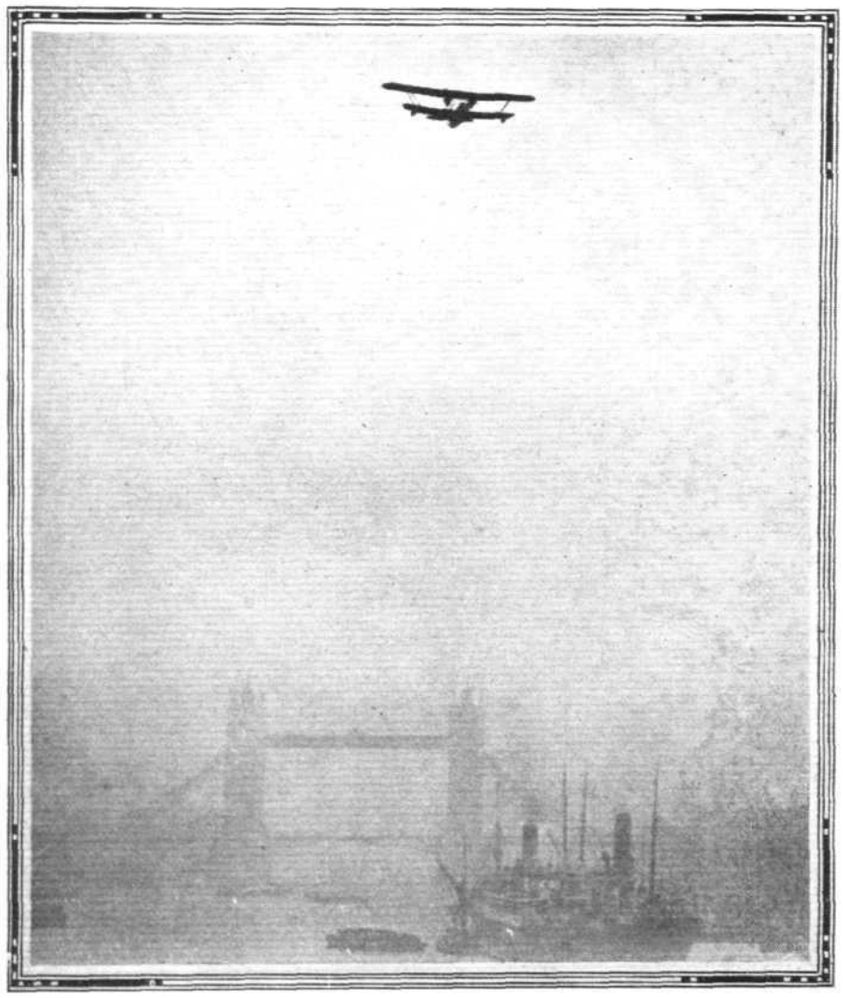
Out of the somewhat unaccountable mystery which seems to surround the attempt to make a non-stop flight from England to India, at least one fact emerges clearly—the failure of McIntosh and Hinkler to realise their ambition was attributable to impossible weather conditions. It is small consolation to say that this might have been expected at this time of the year. The two adventurous pilots set off, and took their chance, but the fates were against them. After a day and a night in the air, in sleet, rain, hail and snow, it is small wonder that they lost their way somewhat. Still smaller wonder that they had to abandon the attempt to reach Karachi. For some reason best known to themselves the two pilots have elected to shroud their adventure in mystery. The flight was a private venture, and possibly the notoriety attained by so many fliers this year may have caused these two to avoid publicity. At any rate, it is a very considerable consolation to learn definitely that the Bristol "Jupiter" engine was without blame in the matter, and that, in spite of well-nigh impossible weather conditions, it continued to do its work. What with the snow and sleet and cold, it must have had ample excuse for stopping, but being a "Jupiter" it ran on. Higher praise it would be difficult to give.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

Sir Alan Cobham Starts on 20,000 Miles' Tour

"SIR ALAN is setting out on yet another Imperial flight of the first importance, and its successful completion will yield a mass of the most valuable data. One of the fine things about Sir Alan is the eminently sane spirit in which he conceives his great adventures. They *are* great adventures; tokens of a courage and a determination far above the average; but Sir Alan is always guided by a keen intelligence. In consequence, each of his remarkable long-distance air journeys has been planned as a piece of practical service to aviation." In these words Sir Charles Wakefield summed up the general feeling when wishing Sir Alan Cobham, Lady Cobham and the other members of the expedition a successful journey and a triumphant return. The scene was at Rochester, and the occasion was a "send-off" lunch given to the members of the Wakefield Flight of Survey around Africa on November 17, by Short Brothers, Ltd., the builders of the "Singapore" all-metal flying boat on which Sir Alan is making the flight of 20,000 miles, and Rolls-Royce, Ltd., whose "Condor" engines will propel the machine on its long journey.

During the morning a party had travelled down from London to be present at the start of the flight, and although a thick fog in many London districts made the conditions appear far from favourable, it was reported from Rochester, and later confirmed by the visitors, that over the Medway the sun was shining.



["FLIGHT" *Photograph*

THROUGH FOG TO SUNSHINE: The Short "Singapore" flying over London on its way to the coast.

After the luncheon at the "Bull," the party proceeded to the works of Short Brothers on the banks of the Medway, the "Singapore" being moored near the north bank, opposite the works. A dense crowd of people lined the towpath in front of the works, eagerly straining for a glimpse of the famous aviator. After a brief good-bye, Sir Alan's party were conveyed out to the waiting machine, while the visitors awaited the start on the large slipway by one of the large workshops. The tide was low, and Mr. Short's hinged floating slipway was resting quietly on the mud. It was somewhat amusing to reflect that this same slipway has risen and fallen with the tide, alternatively resting on the mud and floating on the river, since 1915 or thereabouts, in spite of the fact that when Mr. Oswald Short first suggested such an arrangement, he was told by experts that his floating slipway would not survive two tides but would be carried away by the current.

The low tide was not altogether favourable for the start, and one mishap due to shallow water had been experienced a couple of days before when, as reported in FLIGHT last week, the "Singapore," on alighting after a test flight, struck some object in the water and sustained several punctures in the bottom immediately forward of the step. The damage had been repaired with amazing rapidity, and as we pointed out last week, a similar puncture in a wood hull would have meant a long delay, since patches made with wood planking cannot be so made as to project, since the thickness is such as would probably cause the water to tear the patch off after a very short time. It would, however, have been annoying, to say the least, if the start should be marred by any such mishap, even if not serious in itself. Fortunately, there was no repetition of the Tuesday's occurrence.

As soon as his party were on board, Sir Alan had the engines started, but instead of casting off immediately, as Mr. Lankester Parker has been in the habit of doing, warming the engines by running-up first one and then the other, cruising around in circles meanwhile, Sir Alan held to his moorings and let the bows of the "Singapore" push into the mud until both "Condors" had warmed up sufficiently. Then the

order to cast off was given, and the two powerful engines were " given the gun " as the Americans say. No stop watch was available wherewith to time the take-off, but the " Singapore " was certainly off in 18 seconds, and probably less. The manner in which the " Singapore " unsticks is little short of amazing, and on one occasion recently, when the present writer had the privilege of being a passenger in this machine during a test flight, with Mr. Lankester Parker at the wheel, the " Singapore " got off in 10 seconds.

Well in the air by the time it passed the slipway, the " Singapore " flew up the Medway for a mile or so, greeted by cheers from the party in front of the works and the onlookers who lined the towpath. Then the machine turned about, flew downstream and, passing low over Rochester, disappeared rapidly in the haze, heading for the Thames on its way to London.

The mist of the morning had not greatly improved by the time the " Singapore " crossed the Tower Bridge, but for all that, by flying very low, Sir Alan Cobham gave thousands of Londoners an opportunity of seeing the large flying-boat starting out on one of the most ambitious cruises of exploration that have ever been undertaken. Whether the good Londoners thoroughly appreciated the significance of the occasion may, perhaps, be open to doubt, but it can safely be said that they enjoyed the sight.

Following the Thames as far as Reading, Sir Alan Cobham headed for Southampton Water, and arrived at Hamble about half past three, having started from Rochester at 1.30 p.m.

Originally it had been intended to start on the first " serious " stage of the flight on the morning of November 18, but the weather was so bad that a postponement became necessary

[" FLIGHT " *Photographs*

" GOOD BYE AND GOOD LUCK " : The Short " Singapore," two Rolls-Royce " Condor " engines, starting on its 20,000-miles flight from Rochester, on November 17. Below, Left, Sir Charles Wakefield, whose generosity has largely made the expedition possible, and, Right, Mr. Oswald Short and Mr. Basil Johnson, of Short Brothers and Rolls-Royce respectively, the firms who produced the flying-boat and its engines.

in order to avoid arriving at Bordeaux after dark. It was not until Sunday, November 20, that the weather conditions improved sufficiently to warrant a start, and, leaving Hamble at 8.30 a.m., Hourtin (Bordeaux) was reached at 4 p.m., the trip being on the whole made in fairly good weather conditions.

Accompanying Sir Alan Cobham on his flight are Lady Cobham, Capt. H. V. Worrall, D.S.C. (assistant pilot), F. Green and C. E. Conway (engineers), and S. R. Bonnet (cinematographer).

From Bordeaux the "Singapore" will go on to Marseilles, Ajaccio, Malta and the coast of North Africa.

"STALLED BUT UNDER PERFECT CONTROL"

Sir Samuel Hoare Tests New Handley Page Automatic Slots

An official demonstration of the new Handley Page automatic wing-tip slots was given at Cricklewood aerodrome on November 18, when Sqdn.-Leader T. England took up in turn the Secretary of State for Air, Sir Samuel Hoare, Lady Maud Hoare, and Major Wimperis, Director of Scientific Research, in a Bristol Fighter fitted with the new safety device. The weather was far from suitable, a cold wind blowing, and the visibility being a few hundred yards on the ground and almost nil at 2,000 ft. In spite of this, however, the demonstration was carried out most successfully, so that the small amount of discomfort due to bad weather was gladly suffered by those present, who must have felt that they were "assisting," as the French say, at a rather historical event.

Upon his arrival, the Secretary of State for Air was accompanied by his wife, the Lady Maud Hoare, by Sir Philip Sassoon, Under-Secretary of State for Air, and Major H. E. Wimperis, Director of Scientific Research at the Air Ministry.

["FLIGHT" *Photographs*

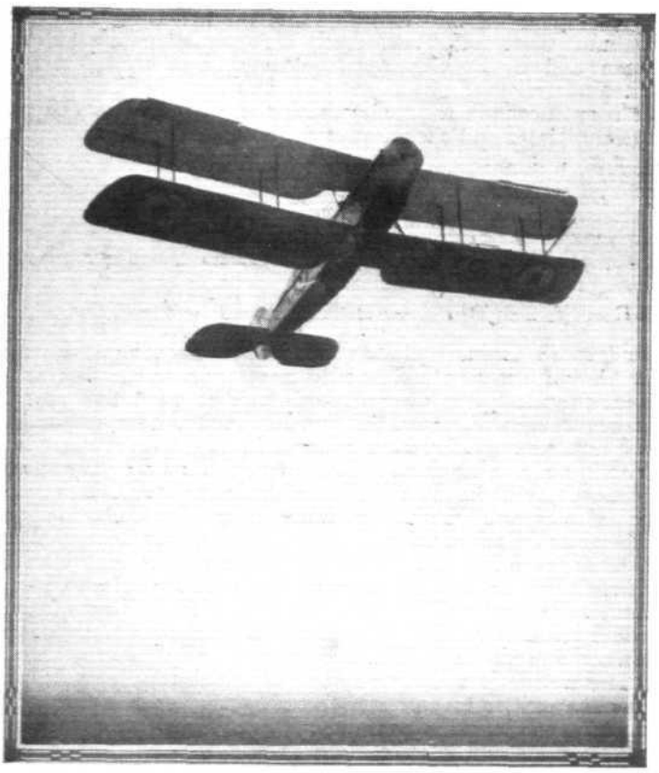
THE NEW HANDLEY PAGE AUTOMATIC WING TIP SLOTS : On the left, Mr. Handley Page is seen explaining the safety device to Sir Samuel Hoare and The Lady Maud Hoare. On the right, a view of the slot, and the angle indicator fitted on the experimental machine to show the angle at which the machine is descending in a horizontal attitude. The indicator is limited to an angle of 30 degrees, but the machine actually descends much steeper than that.

Mr. Handley Page briefly explained the function of the wing tip slots to the distinguished party, and then Sir Samuel Hoare took his seat in the gunner's cockpit of the Bristol Fighter, with Sqdn.-Leader England in the pilot's seat. Taking off, the machine was repeatedly put into a stalled attitude, and while descending at a steep angle, although almost on an even keel, it was rocked from side to side to demonstrate that it was still under perfect control. "Tail swishing" was another performance demonstrated, and in spite of the poor visibility, it was possible in many of the manœuvres to see the slots on opposite sides alternatively open and close.

When the Secretary of State for Air had alighted from the machine, the seat in the aft cockpit was taken by his wife, Lady Maud Hoare, who thus became the first lady passenger to try for herself the new safety device. By her flight with her husband to India, Lady Maud Hoare had already shown her faith in commercial aviation, and it was very fitting that she should also be the first lady to experience the first really great practical step towards added safety in flying. As far as could be seen from the ground, Sqdn.-Leader England did not spare his second passenger, and Lady Maud was given just as thorough a demonstration as was her distinguished husband. In fact, some evolutions, very low down, looked somewhat alarming, and even more convincing than those carried out with the Secretary of State on board.

After his flight, Sir Samuel Hoare expressed himself very pleased with the experience, and said the descent with engine throttled down and the machine stalling at a steep angle rather reminded him of going down in a high-speed American lift.

The writer of these notes was privileged to go up in the machine earlier in the afternoon, and certainly the manner in which the machine could be "thrown about" while stalled was little short of amazing. The angle indicator fitted to the front port strut showed 30 degs., but as this was the limit of its travel, and it was obviously tightly held against the top stop, it appears likely that the actual angle of descent was considerably steeper than that. The feeling of "sitting still" in the air, with apparently no forward speed, was one of the most extraordinary experiences one can imagine. Unlike the Secretary of State for Air, one had not the feeling of dropping as in a lift, but that is to be ascribed to the fact that Sir Samuel Hoare has spent very many more hours in the air than has the writer, and is thus a very experienced air traveller. What was quite obvious and unmistakable was the feeling of security experienced. At the time we were at about 2,000 ft., and so it was difficult to see the ground. Possibly this may have accounted for the fact that one failed to realise the rapid rate of descent, which must have been something like 30 ft. per second. It is just



["FLIGHT" *Photograph*

"STALLED, BUT UNDER CONTROL": The Bristol Fighter, piloted by Squadron-Leader England, giving a demonstration of the new Handley Page automatic slots. In the photograph these can be seen in the open position. The rest of the wing is stalled.

possible that this may constitute a slight danger in the case of a failing engine at low altitude, whose pilot is preoccupied looking for a suitable landing ground. The controllability is so perfect that he may very easily momentarily forget that he is losing height rapidly, although the very fact that the ground is close might very likely serve as a useful guide in this respect. The rate of descent is certainly far too rapid to allow of absorbing the shock by means of undercarriages as we know them to-day, although there is every possibility that the occupants of a machine would escape with a severe shaking, where in the case of a dive following a stall they would inevitably be killed. Thus there can, we think, be little doubt that although the automatic slot does not solve the whole problem of safety in flight, it does very definitely mark a very important step indeed in the right direction.

It has been suggested that the automatic wing-tip slots are suitable for all machines except single-seater fighters. Whether that is likely to be the case or not is too early to say yet. The reason usually advanced is that a single-seater fighter is frequently required to be stalled and spun deliberately. In the first place, it is a little doubtful whether this manœuvre, favoured as a ruse more than anything else in the last war, will have much utility in the next. But even if it be decided to retain the ability to spin as a desirable feature, there would appear to be a way out of the difficulty.

The automatic slots, with their ability to retain control beyond the stall, are only really required when close to the ground. That being so, there would not appear to be any great mechanical difficulty in making arrangements, on such types of aircraft as were desired to be able to spin, for the slots to be operative up to a height of 1,000 ft., or so, and then to be automatically locked in the closed position, the actuating mechanism being set in motion by a relay worked from an altitude meter.

We gather that quite a number of different types of service aircraft are to be fitted experimentally with the automatic slots, and as a result of the collective experience thus accumulated, progress should be fairly rapid.

Concerning the slot mechanism itself, it may be said that this is exceedingly simple and light. Auxiliary aerofoils are hinged to the leading edge by a series of parallel, or nearly parallel, links. When the wing section is at a small angle of incidence, the resultant of the air pressure around the nose of the aerofoil is backwardly inclined, forming an angle with the links and thus keeping the slot closed. As the angle of incidence increases, the resultant of the air pressure points away from the surface more and more until ultimately it becomes parallel with the links and finally makes an angle forward with the links. As soon as that happens the auxiliary acrofoil moves forward and upward, opening the slot, until once more the links have become parallel with the resultant.

["FLIGHT" *Photographs*

OFFICIAL DEMONSTRATION OF THE AUTOMATIC SLOT: Last week, Sir Samuel Hoare, Secretary of State for Air (left), and Major H. E. Wimperis, Director of Scientific Research, made flights at Cricklewood in a Bristol Fighter fitted with the new Handley Page automatic slots. The pilot was Squadron-Leader T. England, who is seen above with his two distinguished passengers.

The AIRCRAFT ENGINEER

FLIGHT ENGINEERING SECTION

Edited by C. M. POULSEN

November 24, 1927

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EDITORIAL VIEWS

After many years of "preaching the gospel" of the seaplane, FLIGHT at last has the satisfaction of seeing that type of aircraft gradually coming into its own. Two Empire cruises in which the flying-boat is used are now progressing, and there is every probability that within the next few months the first Short "Calcutta" will commence what is hoped will be a series of very interesting and instructive tests. Hitherto THE AIRCRAFT ENGINEER has not been able to secure very much material relating to the seaplane, and it is, therefore, with all the greater pleasure that we welcome in the present issue Mr. A. Gouge, chief designer of Short Brothers.

Mr. Gouge very rightly and properly takes as his starting point the "take-off," as this is one of the respects in which hitherto the seaplane has been somewhat inferior to the landplane. In his article Mr. Gouge examines the relative importance of the various factors which enter into calculations concerning take-off, and comes to the conclusion that wing loading does not greatly affect the total load with which a flying-boat will leave the water, but that it does seriously affect the length of run required.

As regards power loading, a very important factor in so far as suitability for long-distance work is concerned, Mr. Gouge decides that a good modern flying-boat will leave the water with a power loading of up to 21 lbs./h.p. As this figure does not take into account future development in hull design, and as there is no doubt that considerable improvement in resistance is still to be expected, it is reasonable to assume that before long it will be possible tot ake a flying-boat off the water with as high power loadings as those of recent landplane long-distance machines. Which is most encouraging for the future of the flying-boat.

Wheel brakes for aircraft are becoming necessary, and Mr. G. H. Dowty, who has done some very important work on aircraft arrester gear in connection with the Gloster Aircraft Company, contributes an article this week on the subject of wheel brakes. It is hoped that Mr. Dowty will, in subsequent issues, treat in some detail with such problems as the effect of braking on the machine, brake requirements and design, application to wheels of spoke or disc construction, and methods of brake control.

AN INVESTIGATION INTO THE "TAKE OFF" OF FLYING-BOATS.

By A. GOUGE, B.Sc., A.F.R.Ae.S.

In recent years it has become evident that the flying-boat is rapidly developing into a very important means of aerial transport, in addition to its natural development for naval uses.

This development is largely due to research work on hull forms, both in England and America, for in the design of a successful flying-boat the design of the hull is as important as the flying structure. The successful use of aluminium alloys for the structure of the hull has been a means of saving a considerable amount of weight, and has enabled large flying boats to be produced whose performance is equal to that of any similar-sized land machines.

The actual use of flying-boats as real commercial machines is still in its infancy in England, but the writer is of the opinion that rapid development will take place in this direction. The use of flying-boats as commercial machines of long range leads in the first place to considerations of the "take-off." Thus, to enable the machine to have a considerable range, carrying a reasonable amount of useful load, it is necessary to load up the machine fairly highly, particularly with regard to horse-power. This leads at once to the question of "take-off," for it is essential that the machine should leave the water as soon as possible.

The actual length of run that should be allowed will depend almost entirely upon the waterway from which the boat is to "take off." On almost any river mouth in England, a run of 600 or 700 yards could be obtained, and at chosen points runs of 3,000 yards could be made in practically any direction without the machine encountering the open sea. It will be shown later that if a good flying-boat is to leave the water with its maximum load, a run of between 2,000 and 3,000 yards will be necessary. This point is worth considering by any company selecting a "landing ground" for long-range flying-boats.

The following work was attempted with the object of determining the relative importance of the various factors which enter into any calculations made on the "take-off" of flying boats. The main factors are:—

(1) The horse-power available or rather the effective thrust.
(2) The water resistance of the hull.
(3) The air resistance.
(4) The wing area. (This is proportional to the "take-off" speed.

Dealing with (1) for the purpose of these calculations, the

accelerating thrust (that is the actual thrust, less the resistance due to the slipstream) is assumed to be proportional to the horse-power, that is :—

accelerating thrust = T = N (HP)..... (1)

This does not pretend to be exact, but is reasonably correct for the purpose we are using it, and for boats of the type under consideration.

The water resistance of the hull is assumed to be of the form

$$R_w = qw\left(\frac{V}{V_o} - \frac{V^2}{V_o^2}\right) \quad \ldots\ldots(2)$$

Where R_w is the water resistance

w is the all up weight.

q is a constant depending on the hull shape.

V is the velocity.

V_o is the velocity at "take-off."

The above is equivalent to assuming that the water resistance of a good hull may be taken as following a parabolic law with regard to velocity, the maximum resistance occurring at half "take-off" speed. This is not exact, but in Fig. 1 the assumed resistance is shown together with the actual resistance of a hull of normal English form.

The air resistance is assumed to be given by :—

$$R_a = lw\frac{V^2}{V_o^2} \quad \ldots\ldots(3)$$

$$\frac{VdV}{dx} = \frac{gN}{P} - \frac{gqV}{K\sqrt{L}} + \frac{g}{K^2L}(q-l)V^2 \quad \ldots\ldots(4^a)$$

The solution of (4) gives :—

$$t = \frac{2K\sqrt{PL}}{Cg}\left\{\tan^{-1}\frac{\frac{2}{K}\sqrt{\frac{P}{L}}(q-l)\,V - q\sqrt{P}}{C} + \tan^{-1}\frac{q\sqrt{P}}{C}\right\} \quad \ldots\ldots(5)$$

where $C = \sqrt{4N(q-l) - q^2P}$

Substituting $V = V_o = K\sqrt{L}$ in equation (5) we obtain the time to take off.

$$t = \frac{2K\sqrt{PL}}{Cg}\left\{\tan^{-1}\frac{(q-2l)\sqrt{P}}{C} + \tan^{-1}\frac{q\sqrt{P}}{C}\right\} \quad \ldots\ldots(6)$$

The solution of (4a) gives, where x is the run to "take off."

$$x = \frac{K^2L}{g(q-l)}\left[\tfrac{1}{2}\log_e\left(1 - \frac{Pl}{N}\right) + \frac{q\sqrt{P}}{C}\left\{\tan^{-1}\frac{(q-2l)\sqrt{P}}{C} + \tan^{-1}\frac{q\sqrt{P}}{C}\right\}\right] \quad \ldots\ldots(6^a)$$

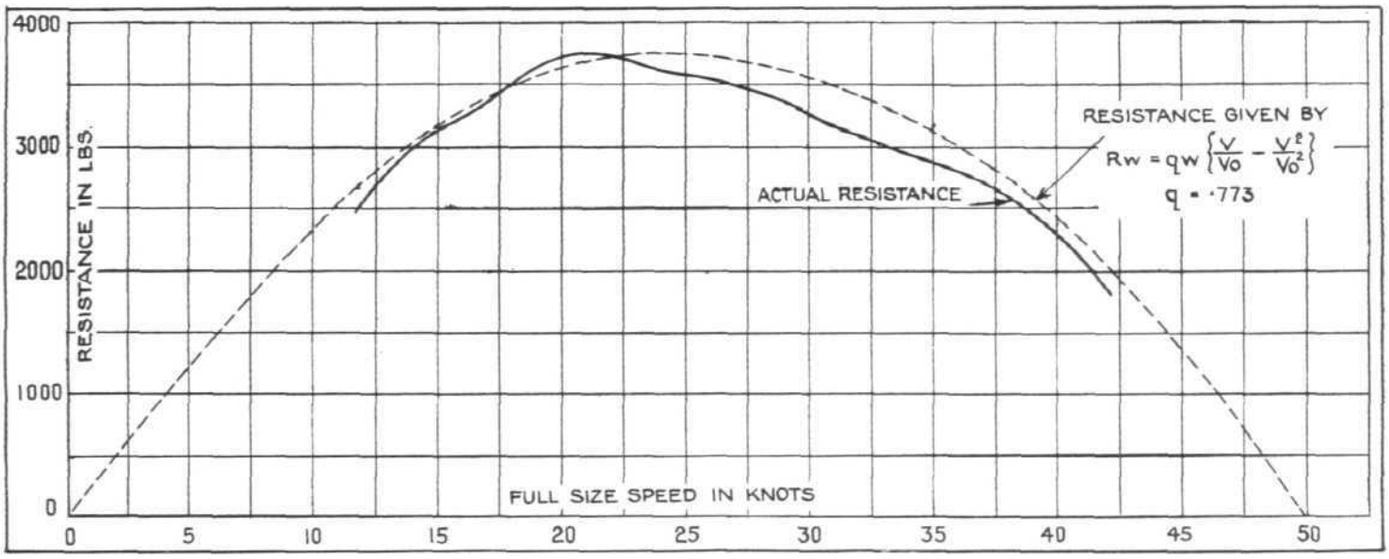


Fig. 1. Comparison between actual and calculated resistance of flying boat hulls.

where R_a is the air resistance

l is a constant depending on the efficiency of the aerodynamic structure.

Using these results, the equation of motion during take-off becomes :—

$$\frac{d^2x}{dt^2} = g/w\left\{N\,(\text{H.P.} - lw\frac{V^2}{V_o^2} - qw\left(\frac{V}{V_o} - \frac{V^2}{V_o^2}\right)\right\}$$

or

$$\frac{dV}{dt} = \frac{gN\,(\text{H.P.})}{w} - \frac{gqV}{V_o} + \frac{g}{V_o^2}(q-l)V^2$$

or

$$\frac{VdV}{dx} = \frac{gN\,(\text{H.P.})}{w} - \frac{gqV}{V_o} + \frac{g}{V_o^2}(q-l)\,V^2$$

If now we substitute $K\sqrt{L}$ for V_o and P for $\frac{W}{\text{H.P.}}$, where P is the power loading, L the wing loading and K is $\frac{1}{\sqrt{\rho K_L \text{ max.}}}$, we get

$$\frac{dV}{dt} = \frac{gN}{P} - \frac{gqV}{K\sqrt{L}} + \frac{g}{K^2L}(q-l)\,V^2 \quad \ldots\ldots(4)$$

and

A simple way of finding x if t is calculated first is by the equation.

$$x = \frac{K\sqrt{L}}{2(q-l)}\left\{\frac{K\sqrt{l}}{g}\log_e\left(1 - \frac{Pl}{N}\right) - qt\right\} \quad \ldots\ldots(6^b)$$

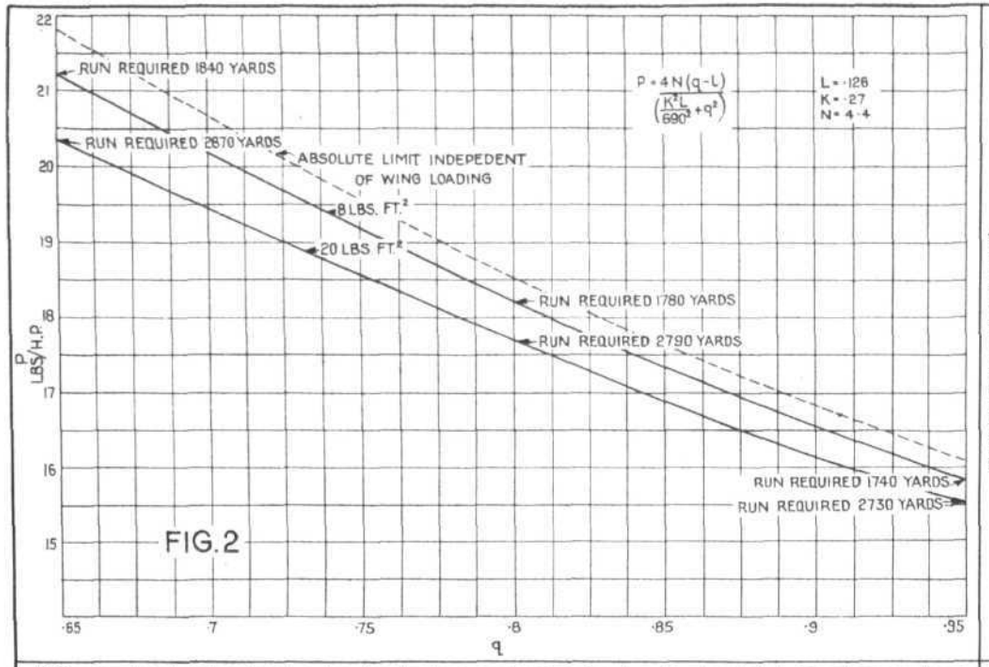
From (6) it can be seen at once the limit in "take off" (when the time becomes infinite) is given by :—

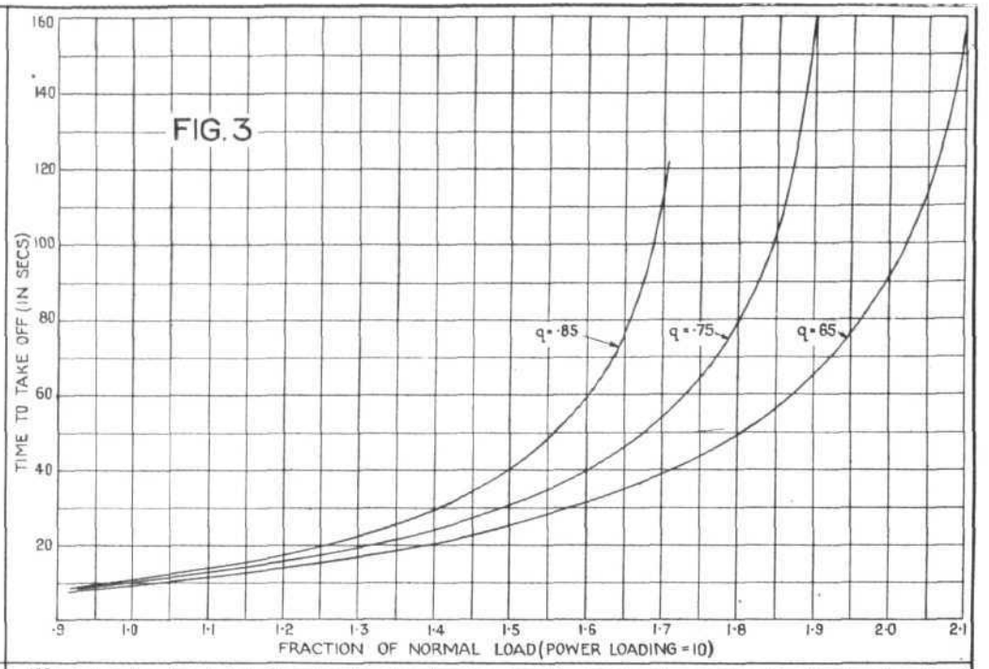
$$C = 0$$

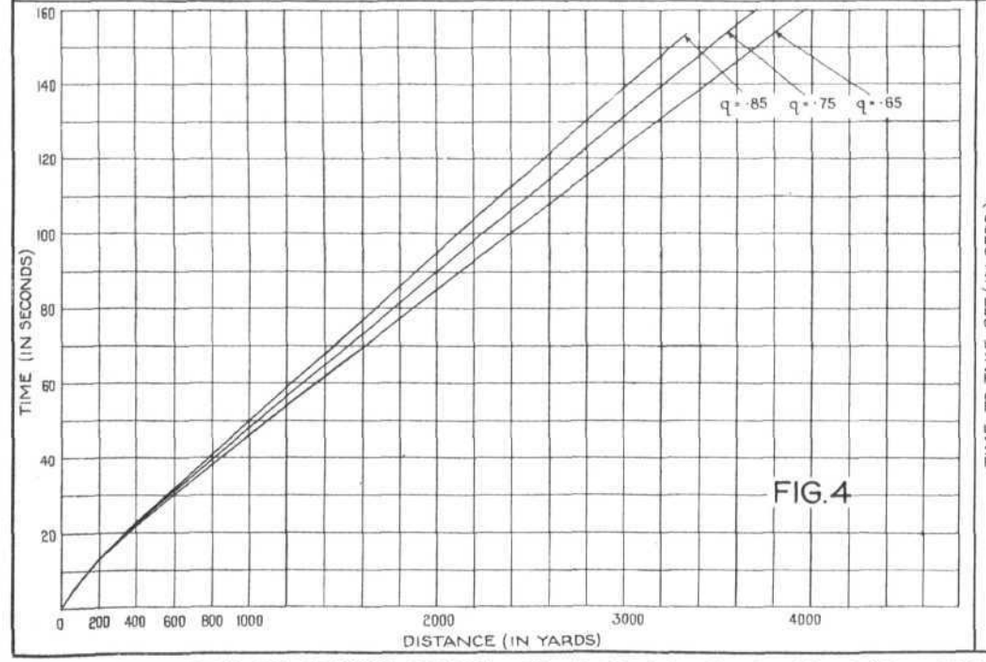
that is when

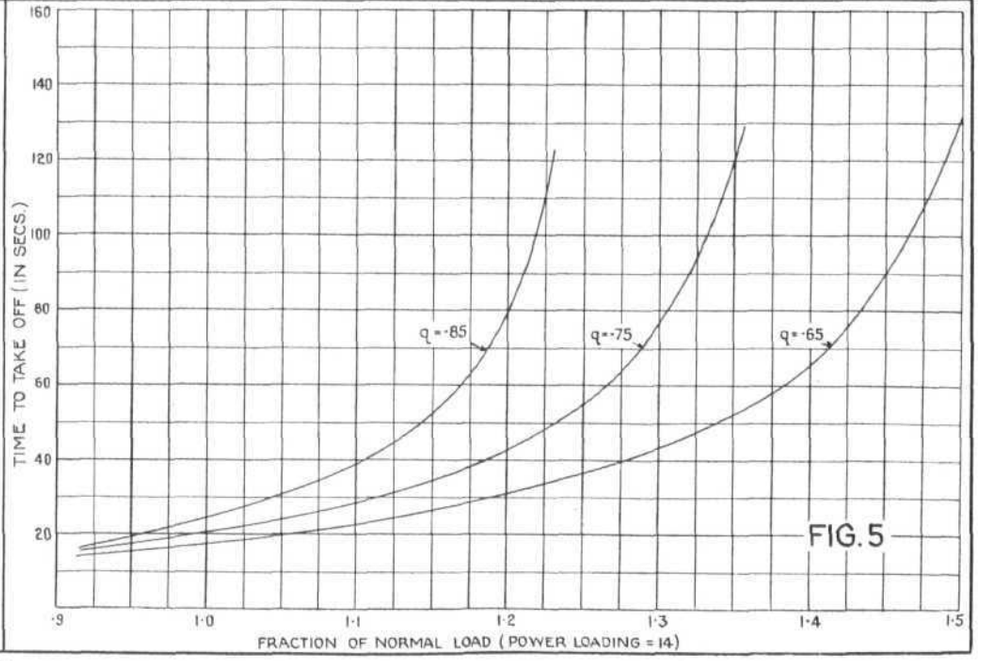
$$P = \frac{4N(q-l)}{q^2} \quad \ldots\ldots(7)$$

This brings out the fact that with the assumption made the limiting load a flying-boat will take off with is independent of the wing loading. This final load is, however, of no practical value, what concerns us is the load with which a flying boat will "take off" with in a time of, say, two minutes, for this will be approximately the maximum time allowable. In equation (6) it will be noticed that as the time approaches infinity the value of the part within brackets approaches π and never exceeds it, its value when the time is limited to approximately 120 seconds, we will assume to be 2·8 which is not far removed from the exact figures for a series of actual









THE "TAKE-OFF" OF FLYING BOATS: Fig. 2. Limiting Load with which a Flying Boat will take off when the time required is approximately 2 minutes. Figs. 3 and 5. Times to take off at various overloads with power loadings of 10 and 14 lbs./h.p. respectively. Fig. 4. Time against run to take off for the boats represented in Fig. 3.

cases that have been worked out. Using this value we get :

$$120 = \frac{2K\sqrt{PL}}{Cg}\left\{2\cdot8\right\}$$

whence

$$\left(\frac{K^2L}{690^2} + q^2\right)P = 4N\,(q - l) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(8)$$

If now equation (8) be compared with equation (7) it will be seen that by approximately limiting the time of run to two minutes that the "limiting take off" value of P is decreased in the ratio q^2 to

$$\left(\frac{K^2L}{690^2} + q^2\right)$$

The time of "take off" will, therefore, be approximately two minutes when

$$P = \frac{4N(q - l)\,690^2}{(K^2L + 690^2\,q^2)} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots(9)$$

If, now, in equation (6*b*) t be given the value of 120 seconds the run to "take off" will be given by :—

$$x = \frac{K\sqrt{L}}{2(q - l)}\left\{\frac{K\sqrt{L}}{g}\log_e\left(1 - \frac{Pl}{N}\right) + 120q\right\} \quad \ldots\ldots(10)$$

For normal flying-boats whose top speed is between 100 and 120 m.p.h., the value of N will be somewhere between 3·5 and 4·5 depending upon the pitch angles of the propeller and its speed of rotation. For a geared engine the propeller of which runs at 1,000 to 1,200 r.p.m., the value 4·5 is nearly correct ; for an ungeared engine the lower value should be used.

The value of K is 29·2 for a lift coefficient of 0·5 and 25·5 for a lift coefficient of 0·65.

The value of l, which is the ratio drag to lift of machine without the hull and no slipstream effect, will, for normal machines, lie between 0·12 and 0·15.

The value of q is four times the maximum water resistance of the hull divided by the displacement, if no figures of the water resistance are available q may be assumed to be from 0·65 to 1, 0·65 representing a very good hull and 1 a rather poor one.

It is interesting now to assume definite values of N, l and K applicable to a good modern machine and then plot values of q against the power loading P in equation (9) for various wing loadings L. This is shown by figure 2.

The value of the constants assumed being :—

N = 4·4
l = 0·126
K = 27
L = 8 lbs. per sq. ft., and L = 20 lbs. per sq. ft.

The length of run required has also been calculated by equation (10), and is written on the graph for values of q = 0·95, 0·80, and 0·65. From these curves, it would appear that in the case considered that the wing loading does not seriously affect the total load with which a flying-boat will leave the water, the water resistance being far more important. The wing loading, however, does seriously alter the length of run required, thus, taking q as 0·8, the run required to take off in two minutes is approximately 1,780 yards for 8 lbs. per square foot, and 2,790 yards for 20 lbs. per square foot, the length of run being, for all practical purposes, proportional to the square root of the wing loading for a constant time to take off.

If the length of run were used as the criterion of take off, then the machine whose wing loading was 8 lbs. per square foot, could obviously take a little greater power loading than shown on the curves, this increase in power loading would, however, be very small, the dotted line on the graph indicating the absolute limit of "take off" independent of wing loading as given by equation (7).

It would also appear that a good modern flying-boat will leave the water at a power loading of between 18 and 21 lbs. per horse-power, which gives a very good indication of the possibilities of long-range flying-boats.

It will be observed that the thrust is assumed to be 4·4 times the available horse-power which may not be realised on a high-speed boat.

In Fig. 3, the time to "take off" is plotted against fractions of normal loading for various values of q, the other constants remaining the same as in the previous case.

The normal loading is assumed to be 10 lbs. per square foot, and 10 lbs. per horse-power ; thus at fraction 1·5 normal load, the wing-loading will be 15 lbs. per square foot, and the power loading 15 lbs. per horse-power.

In Fig. 4 the run required to "take off" is shown plotted against the time to "take off" for the same case. The assumption made that the water resistance is proportional to the all-up weight will be approximately correct for a 25 per cent. overload on a well-designed hull, but would not be expected to hold for a much greater overload, so that in Figs. 3 and 4 the curves should not be expected to apply to the same hull throughout. To determine how near the formula given in this article would apply to an actual overloaded hull, a model hull was tested at various overloads, the propeller thrust calculated as accurately as possible, and the time of "take off" found by step-by-step integration. The following table gives the comparison :—

Normal Load. Per cent.	Time to take off by Formula. Secs.	By Step-by-Step Integration. Secs.
100	20	20
111·5	29·7	30
127	52·3	56·8

The constants for the machine at normal load are :—
P = 13, L = 10·77, N = 3·9, K = 25·5, q = 0·675
l = 0·125.

From the above, it is seen that the time is practically correct for 11·5 per cent. overload, and that the formula under-estimates by about 8 per cent. for a 27 per cent. overload.

Fig. 5 is similar to Fig. 3 except the normal loading is 10 lbs. per square foot, and 14 lbs. per horse-power.

WHEEL BRAKES AND THEIR APPLICATON TO AIRCRAFT.

By G. H. DOWTY, A.F.R.Ae.S., M.I.Ae.E.

Until quite recently wheel brakes have not been seriously considered in connection with aircraft, for their fitment has generally been regarded as a menace rather than an advantage. Their use has always been associated with a tendency for pitching of the machine on its nose, and, in any case, to give no great advantage when compared with the additional weight and complications consequent to their adoption.

Compared with the motor vehicle, brakes on an aeroplane have a very restricted use, and are confined to checking the length of run on alighting and subsequent operations on the ground.

It must be admitted that the aeroplane exists under a considerable handicap, in that it requires a greater space within which to arrive and depart than any other means of transportation. The aeroplane is the only vehicle used which does not apply brakes on stopping, and yet it is the one mostly in need of braking, since its speed is the greatest.

The advantages to be gained from braking have not been ignored, and in the search for a suitable method many schemes have been suggested and tried. The following have been some of the most popular methods to receive attention :—

(1) Increasing the height of the undercarriage to produce a large angle with the ground.

(2) Air brakes of various forms such as expanding rudders and flaps.

(3) Sprags on tail skid and axle.

(4) Wheel brakes.

The first method, while satisfactory, is necessarily limited, and has the further objection that it is not positive.

Air brakes have been repeatedly tried, but have always been discarded because of their almost negligible effect at low speeds.

Provision of sprags on the tail skid has the disadvantage of setting up heavy loads in the fuselage and, furthermore,

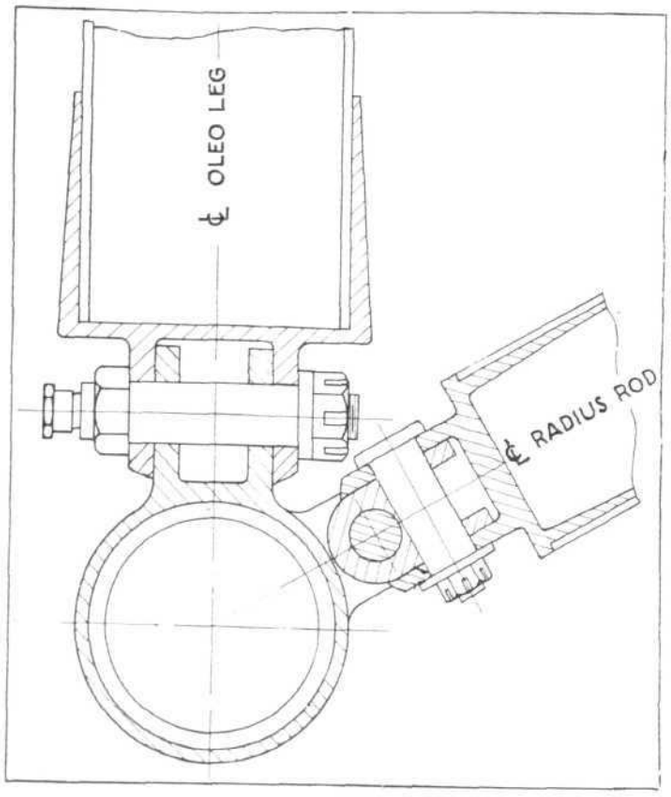


Fig. 1.

their use is to be deprecated owing to the excess damage caused to the landing ground.

Wheel brakes are the subject of this paper. Their use on aircraft is not new, for many forms of this type of brake have been tried out. Generally such brakes have been fitted in conjunction with a leading wheel or skid to prevent the machine turning over. The recent popularity of braking has been chiefly due to the requirements of ship-board landings and a general tightening up of aircraft specifications.

It has been suggested that reversing the airscrew would meet the requirements of a suitable brake, but the mechanical difficulties have not, as yet, been overcome. With the advent of the variable pitch airscrew this may be possible, but this form of braking would not be effective with the engine stopped.

The use of slotted or variable camber wings will, in a great measure, achieve the object of minimising the space required for taking off and alighting, but over and above this feature there always remains the question of manœuvrability on the ground. In some cases the pilot can obtain a certain amount of directional control by a burst of engine, and the slip stream effect produced thereby, but in many cases, particularly in deck work, this may not be possible.

It is not unusual for a large personnel to be required to assist handling of machines, and it is here that independently-operated wheel brakes can be of value in simplifying ground work and reducing the number of ground staff to a minimum.

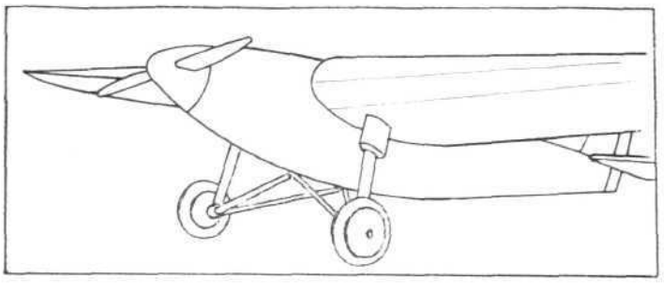


Fig. 2.

Recent developments, particularly in America, have demonstrated the value of aircraft wheel brakes, and proof is given from the figures of the recent American National Air Tour. The figure of merit for determining the winning machine of this competition was based on the formula :—

$$\frac{W \times V_{max.} \times 50}{C\,(T_s + T_{us})}$$

where

W = Useful load (lbs.).
$V_{max.}$ = Maximum flying speed (M.P.H.).
C = Engine capacity (cub. ins.).
T_s = Time to "stick" (secs.).
T_{us} = Time to "unstick" (secs.).

The high value attached to quickness of pull up, or time to "stick," is apparent, and it is therefore not a matter of surprise to find that of thirteen machines starting, ten were equipped with wheel brakes. Of the eleven machines to complete the competition the first places were all occupied by machines fitted with these brakes.

The promoters of the Guggenheim Safe Aircraft Competition attach such great importance to the ability of a machine to pull up quickly that they have allocated over half the total number of points to be awarded for these tests. Out of a total of 200 points, 40 points are given to a machine coming to rest, in calm air, in 40 ft. after touching the ground, and a further 75 points are awarded for the ability of a machine to come to rest, in calm air, 150 ft. from a 35-ft. obstruction. It would therefore seem desirable, if not essential, for competing machines to be equipped with wheel brakes.

High-performance aircraft for deck landing will benefit by braking owing to the very limited length of run available.

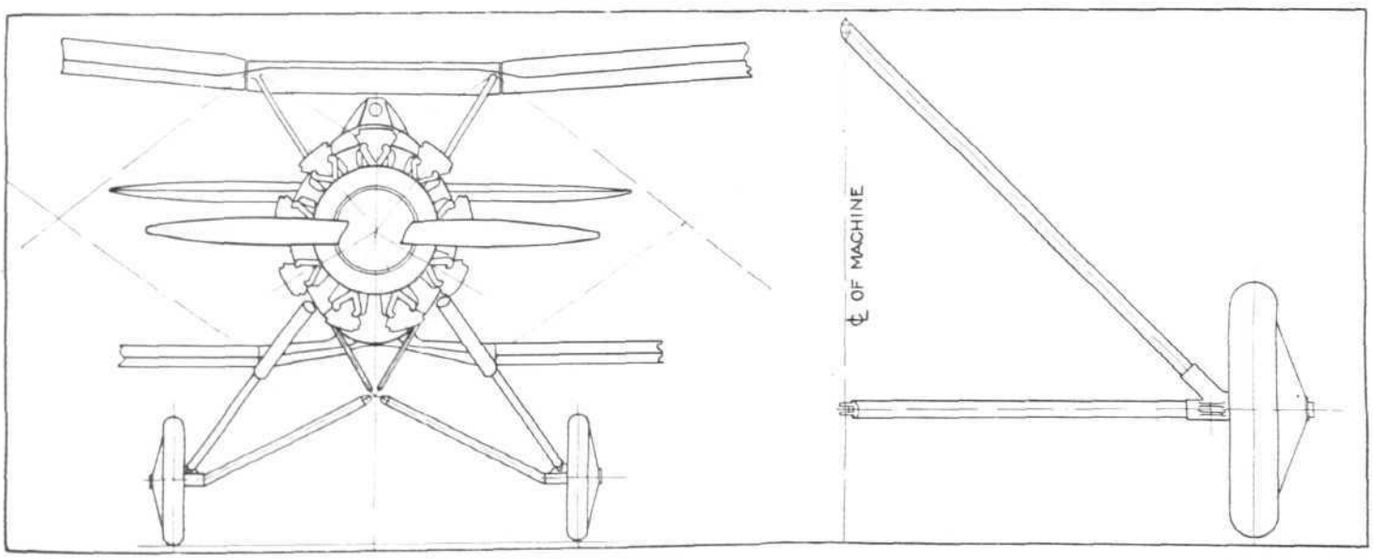


Fig. 3.

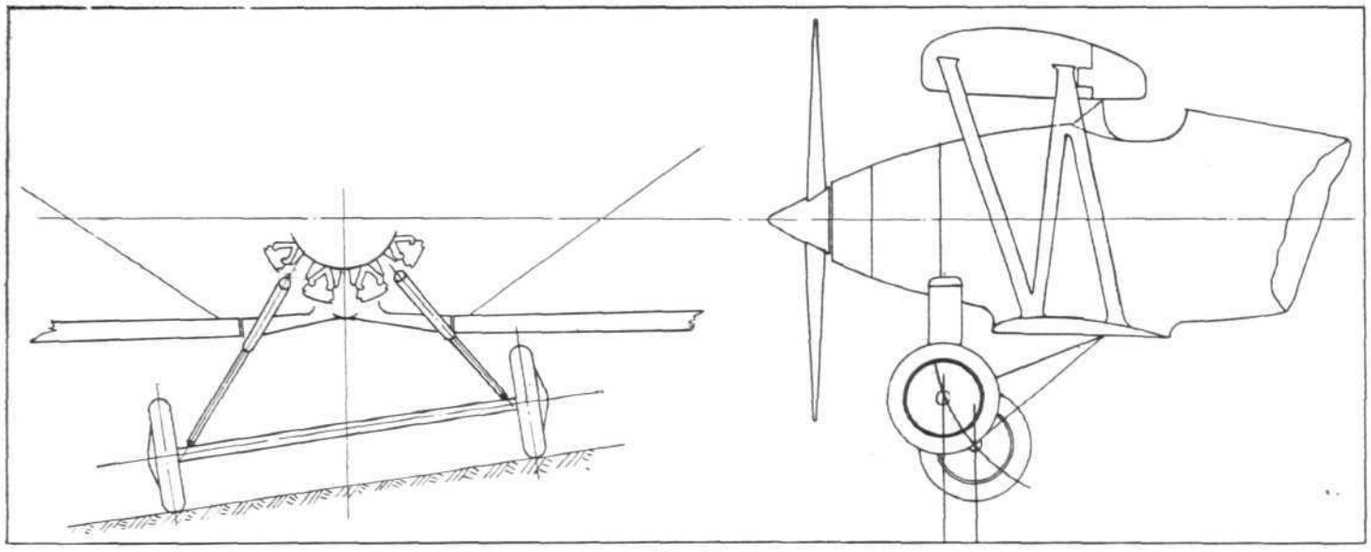


Fig. 4.

Land machines will possibly find an advantage due to the very fine steering qualities provided by the brakes and by the possible elimination of wheel chocks for the preliminary starting and running up of the engine. In this connection, wheel brakes should make a strong appeal to the light plane owner, who would appreciate the additional advantages on occasions when assistance was not available.

The fitting of wheel brakes necessitates careful consideration for its effect on general design conditions. It will be found that provision must be made to take the torque reaction of the brakes, and that a revised undercarriage structure is necessary. The more or less orthodox type of undercarriage, comprising Oleo Leg, Axle, Radius Rod and Cross Bracing, is not, in itself, a suitable structure for taking the torque reaction.

Fig. 1 shows a typical undercarriage joint where the radius rod is universally mounted to the axle fitting. If this axle was subject to torsion, the whole of the reaction would be taken in bending by the oleo leg. This is not permissible because the leg is composed of telescopic members, and excessive bending would prevent the leg from functioning. This snag could be partly overcome by the substitution of telescopic tubes of larger diameter and gauge, but there always remains the objectionable feature of heavy and clumsy fittings for transmitting the loads from the axle, and the increased frontal area, in the slip stream, due to the greater diameter of leg. There is an alternative scheme for mounting the oleo leg on a universal joint, thereby ridding that member of bending, and taking the torque reaction in bending on the radius rod. Such a scheme necessitates the radius rod being built integral with the axle, and while this method may appear tolerably good for taking the vertical loads and torque reactions, yet under side loading, the stresses set up will be very great. If we consider any stretch in the cross bracing wires, then the loads become of a somewhat indeterminate nature, because the axle and radius rods form the sides of a frame having rigid joints. It would appear that the usual type of undercarriage structure is not suitable for carrying wheel brakes, and neither does it lend itself to easy adaptation.

There are several types of undercarriage structures suited for taking brake loads, and these have been developed to a large extent in America, where wheel brakes are becoming normal equipment. Fig. 2 shows a type of undercarriage used on the Hamilton monoplane. This consists of a sprung member and two axles which form a pylon with apex at the wheel hub. The axles are socketed in a "Y" fitting and their respective ends are pinned to the underside of the body on the centre line of the machine. The large distance between the body fittings makes for a good base, with adequate provision for taking the torque reaction. A type of structure suitable for a biplane is illustrated in Fig. 3. This consists of a sprung member and two axles socketed together, as depicted in the plan view. The ends of the axles are attached to separate pylon structures and pivoted on the centre line of the machine. On both the undercarriages shown in Figs. 2 and 3, the wheels track outwards, and this may be cited as a disadvantage, in view of the tendency for the tyres to rip from the rims. If due care is taken in the design to make provision for greater vertical rise than the corresponding movement outwards, then there need be no fear of any such trouble arising.

The types of undercarriage structure shown in Figs. 2 and 3 have a most desirable feature, which should make an appeal to those concerned with the design of deck-landing aircraft. It is difficult to avoid one-wheel landings on board ship, due to rolling of the deck, and with the type of undercarriage using a radius rod, the wheel touching the deck first will move ahead, so that when the other wheel makes contact there will be considerable difference in their longitudinal positions. This condition is shown in Fig. 4, and must produce racking of the structure and directional instability. These disadvantages are completely overcome in the two schemes shown above, for the wheels have no fore and aft movement.

The foregoing remarks will serve to indicate the nature of the modifications to the aircraft structure that are desirable in order that wheel brakes may be incorporated.

TECHNICAL LITERATURE.

SUMMARIES OF AERONAUTICAL RESEARCH COMMITTEE REPORTS.

THE DISTRIBUTION OF NORMAL PRESSURES ON A PROLATE SPHEROID*

By R. JONES, M.A., D.Sc.

R. & M. No. 1061. (Ae. 244). (87 pages.) December, 1925. Price 3s. net.

The experiments were conducted in order to obtain (*a*) a more complete comparison between a theoretical and experimental determination of the distribution of pressure over a spheroid. R. & M. 600 shows that very good agreement obtains in the cases there considered; (*b*) the effect of rotation on the distribution of pressure. The results of (*b*) will be of importance when examining the stresses set up in the structure of Rigid Airships in curvilinear flight.

Pressures were observed on the surface of a prolate spheroid (ratio of axes 4 : 1) (1) when supported in a wind tunnel at 40 ft./sec. at various angles of yaw (rectilinear motion); (2) when spinning about a minor axis (pure rotation, at four different speeds); (3) when supported on the whirling arm

* Royal Society, Series A., Vol. 226, pp. 231–266.

and moving in a circle (curvilinear motion) at several angles of yaw and speeds. The pressures were integrated to give the drag, lateral force, and yawing moment.

A theoretical calculation of the pressures by the usual methods of hydrodynamics applicable to an ideal fluid was carried out for comparison.

Good agreement obtains between theory and experiment almost over the entire spheroid in case (1). The agreement falls off at the after end.

The total drag as measured on the balance is from twice to 2·5 times that obtained by integration. The total lateral force and yawing moment are respectively 1·25 and 0·87 times those obtained by integration.

In case (2) agreement is not good at the extremities of the spheroid. There is a decided speed effect, and theory tends to become closer to experiment as the speed increases.

Good agreement is also obtained in case (3), though perhaps not so good as in case (1). The effect of rotation is actually about twice that deduced from theory, but is not in general large at the angular velocity considered.

MODEL EXPERIMENTS ON R.A.F. 31 AEROFOIL WITH HANDLEY PAGE SLOT.

By H. B. IRVING, B.Sc., A. S. BATSON, B.Sc., and D. H. WILLIAMS.

R. & M. No. 1063 (Ae. 245). 8 pages and 4 diagrams. October, 1926. Price 6*d*. net.

An endeavour has been made to slot a good high speed aerofoil section in such a manner that, while obtaining high lift with slot open, the performance of the aerofoil with slot closed is practically the same as that of the original aerofoil.

Lift and drag experiments made on an aerofoil of 10-in. chord and 60-in. span at 60 ft. per second. Chord and maximum thickness of leading aerofoil 0·136 and 0·0164 of main aerofoil chord (10 in.) respectively. A range of position of leading aerofoil was explored, covering the position for highest maximum lift, and including the slot closed position for which the effects of the slight departures from the original section, caused by the rounding of the nose and trailing edge of the auxiliary aerofoil, was investigated.

The highest maximum lift coefficient was 0·908 at 24° incidence, with the nose of leading aerofoil on tangent chord line and at a distance from nose of rear aerofoil of 0·14 of main chord (10 in.).

The maximum lift drag ratio with slot closed was 19·0 as compared with 20·9 when the small grooves at leading and trailing edges of leading aerofoil were faired with wax (*i.e.*, when section was R.A.F.31).

Further experiments on the same aerofoil fitted with a slotted rear flap are proposed, as well as a rough determination of the force on the leading aerofoil for various positions relative to main aerofoil by means of measurement of pressure distribution.

THE EFFECTS OF STAGGER AND GAP ON THE AERODYNAMIC PROPERTIES OF BIPLANES AT LARGE ANGLES OF INCIDENCE.

By H. B. IRVING, B.Sc., and A. S. BATSON, B.Sc.

R. & M. No. 1064 (Ae. 246). 37 pages and 21 diagrams. May, 1927. Price 1*s*. 9*d*. net.

The present work forms a continuation of the biplane investigation on R.A.F.15 section by Cowley and others described in R. & M. Nos. 774, 857 and 872.* In that investigation the range of incidence extended first up to 16°-25°; it was then increased to 40°; and has now been increased to angles as large as from 100° to 120°.

The investigation is primarily connected with the subjects of stability and control at low speeds and spinning, and provides data for the estimation by "strip" theory of the rolling and yawing moments due to rolling of various biplane arrangements.

Lift, drag and centre of pressure have been measured on the following 6-in. × 36-in. biplanes of R.A.F.15 section, and also on a monoplane :—

Gap = chord
Gap = 0·75 chord
} staggers 0° and 30°.

The maximum angle of incidence in the tests varies from 100° for the unstaggered biplanes and the monoplane to 120° for the staggered biplane.

The results demonstrate the considerable effects which biplane arrangement has on lift, drag and centre of pressure at large angles of incidence. These effects are such as may be attributed to variation in shielding of upper wing by lower wing; variation in stagger (within the limits tried) has decidedly the larger effects. The general nature of the results is as follows :—

Reduction in forward stagger or reduction in gap—
- Slightly reduces maximum lift coefficient.
- Increases the falling off in lift-coefficient after the stall—the effect of gap is negligible in this respect.
- Reduces drag coefficient after the stall—stagger has here a very large effect.
- Reduces backward movement of centre of pressure after the stall.

THE APPLICATION OF THE ALGEBRAIC FORMULÆ OF R. & M. 1056* TO PROBLEMS OF AIRCRAFT PERFORMANCE.

By W. G. JENNINGS, B.Sc., N. E. ROWE, B.Sc., AND I. BOWEN, B.Sc.

Communicated by Director of Scientific Research, Air Ministry.

R. & M. No. 1078 (Ae. 259). (11 pages and 11 diagrams). December 1926. Price 9*d*. net.

In report R. & M. 1056, simple algebraic formulæ were obtained for the performance of an aircraft in terms of air density, engine power factor, and certain aircraft, airscrew and engine constants. In the present report, use is made of the formulæ to deduce the change in performance caused by an alteration in the values of these constants.

Comparative performances of a single-seater aircraft are calculated where a change is made in (*a*) the P/D ratio of the airscrew; (*b*) the landing speed; (*c*) the power unit.

The use of overall aircraft and airscrew coefficients is discussed, and the effect on performance of the mutual interference of body and airscrew analysed.

The estimated performances with various airscrews of different pitch/diameter ratios show that when level speed only is considered, the best value of P/D is such that the value of V/nD for top speed is less than the value for maximum efficiency. It can be shown that this point occurs on the envelope for the efficiency curves.

Increasing the permissible landing speed by reducing the wing area decreases the ceiling considerably, and also reduces the rate of climb at the ground slightly, but an appreciable improvement in top speed results.

Increasing engine power by increasing the size of the engine produces only a small decrease of power loading, and hence only a slight improvement in performance results.

The estimated performance of an aircraft is appreciably greater when calculated with reference to aircraft and airscrew characteristics obtained in free air than when account is taken of interference effects. Since the bodies dealt with in this section of the report had considerably lower drag coefficients than are met with in practice, it is possible that the interference is greater with actual aircraft than is here indicated.

If the engine power is assumed to vary as the relative pressure, the curve of maximum rate of climb against standard height is not a straight line, but has a concave curvature, and the true airspeed corresponding to maximum rate of climb increases with height, the rate of such increase varying considerably from one aircraft to another.

* R. & M. 774.—Biplane investigation with R.A.F. 15 section.—Cowley and Lock.
R. & M. 857.—Biplane investigation with R.A.F. 15 section. Part II.—Cowley and L. J. Jones.
R. & M. 872.—Biplane investigation with R.A.F. 15 section. Part III. Tests at various staggers and gap/chord ratios.—Cowley, Gadd, Jones and Skan.

* Algebraic formulæ for the performance of an aircraft at full throttle.—R. S. Capon.

NOTE ON THE REDUCTION OF PERFORMANCE TESTS TO THE STANDARD ATMOSPHERE.

By R. S. CAPON of the AEROPLANE AND ARMAMENT EXPERIMENTAL ESTABLISHMENT (HOME).—Communicated by the Director of Scientific Research.

R. & M. No. 1080 (Ae. 260). (8 pages.) January, 1927. Price 4*d*. net.

A previous report, "Note on the Variation of Engine Power with Height," specified a law of dependence of engine power on pressure. The tests on which the evidence was based were carried out with instruments uncorrected for temperature effects on their calibrations, and it appeared desirable to re-investigate the question with corrected instruments.

An analysis is made of twelve pairs of climbs using test instruments corrected for effects of temperature on their calibrations. A review is included of the results of previous work on the power factor, and an Appendix gives a general method for the reduction of test results to the standard atmosphere.

The law specified by the climbs with the corrected instrument calibrations is $f(p^{\frac{3}{5}}, \rho^{\frac{3}{5}})$. It is indicated that the mean error of the rates of climb determinations is considerably reduced by the use of corrected instruments, and is such that the adoption of a power factor which is a function of pressure only will not do justice to the accuracy of the test data.

Further research is required into a possible effect of twisting of the airscrew and air compressibility on the conclusions of the present note, and the form of the function f is required to be established, either by the use of a torque-meter if available or, if the effects of airscrew twisting and air compressibility are negligible by the standard tests to determine the power factor by the use of the torque equation.

A PARADOX IN FLUID MOTION.

By DR. H. LAMB, F.R.S.

R. & M. No. 1084 (Ae. 263). (4 pages.) December, 1926. Price 3*d*. net.

There is a paradox in fluid motion associated with the mathematical equation for the vorticity. This equation might be interpreted by stating that the rate at which energy is dissipated by viscosity depends solely on the instantaneous distribution of velocity without reference to its antecedents or consequents.

The reason for the paradox is the discontinuity of the second differential coefficient of vorticity with respect to the distance from the boundary; consequently, the rate of the dissipation of energy is not dependent solely on the instantaneous distribution.

WIND TUNNEL TESTS WITH HIGH TIP SPEED AIRSCREWS. THE CHARACTERISTICS OF THE AEROFOIL SECTION R.A.F. 31a AT HIGH SPEEDS.

By G. P. DOUGLAS, M.C., D.Sc., and W. G. A. PERRING, R.N.C., A.M.I.N.A. Presented by The Director of Scientific Research.

R. & M. No. 1086 (Ae. 265). (33 pages and 19 diagrams.) January, 1927. Price 1*s*. 6*d*. net.

The present experiments continue the investigation into the effect of tip speed on airscrew performance reported in R. & M. 884.*

Thrust and torque, and thrust and torque grading have been measured on model airscrews with blades of R.A.F. 31A aerofoil section working with tip speeds up to 1·3 times the speed of sound. The lift and drag characteristics of the blade section for speeds up to the speed of sound have been deduced.

High tip speed in all cases so far tested involves a serious loss of efficiency.

The lift coefficient for R.A.F. 31A blade section at high speeds up to 0·7 of the velocity of sound is considerably greater than the corresponding low-speed value, but above this speed it falls well below it.

The drag coefficient rises slowly with speed up to about 0·6 of the velocity of sound, after which it rises very rapidly.

This section is not suitable for high speed airscrews.

A sharp-nosed section of the same relative thickness has been tested and the results will form the subject of a later report (R. & M. 1091).† An airscrew with thinner sections is being made for further experiments.

* R. & M. 884.—The Effect of Tip Speed on Airscrew Performance.—By G. P. Douglas, D.Sc. and R. McKinnon Wood, M.B.E., B.A.

† R. & M. 1091.—Wind Tunnel Tests with High Tip Speed Airscrews. The characteristics of a bi-convex aerofoil at high speeds.—By G. P. Douglas, M.C., D.Sc. and W. G. A. Perring, R.N.C., A.M.I.N.A.

WIND TUNNEL TESTS ON AEROFOIL R.A.F. 34 AT NEGATIVE INCIDENCES.

By A. S. HARTSHORN, B.Sc. Presented by Director of Scientific Research.

R. & M. No. 1087 (Ae. 266). (4 pages and 2 diagrams.) February, 1927. Price 4*d*. net.

The previous tests on this section given in R. & M. 1071 have been extended to negative incidences in order to provide data for strength calculations for inverted flight.

Lift and drag have been measured at a speed of 80 ft./sec., and the centre of pressure determined, from no lift down to the negative stall. Scale effect at the negative stall has been investigated.

The maximum negative K_L found was 0·33. The scale effect at the negative stall is more marked than that at the positive stall.

WIND TUNNEL TESTS WITH HIGH TIP SPEED AIRSCREWS. THE CHARACTERISTICS OF A BI-CONVEX AEROFOIL AT HIGH SPEEDS.

By G. P. DOUGLAS, M.C., D.Sc., and W. G. A. PERRING, R.N.C., A.M.I.N.A.

(Presented by the Director of Scientific Research.)

R. & M. No. 1091. (Ae. 270.) (21 pages and 14 diagrams.) February, 1927. Price 1*s*. net.

The present experiments continue the investigation into the effect of tip speed on airscrew performance described in R. & M. Nos. 884* and 1086.†

Two airscrews having bi-convex sections have been tested under identical conditions to the R.A.F. 31A airscrews described in R. & M. 1086. The present sections had the same maximum thickness (12·7 per cent.), and centre line as R.A.F. 31A, but had a sharp leading edge and the maximum thickness at the midpoint of the chord. The tests were carried out at tip speeds up to 1·3 times the velocity of sound and the results have been analysed to show the variation of lift and drag.

The general results are very similar to those of R.A.F. 31A. The bi-convex section has considerably more drag at low speeds, but at and above 0·8 of the velocity of sound the differences are within the limits of experimental accuracy. There is evidence of a slight improvement in the lift to drag ratio when the velocity of sound is exceeded.

A survey of the existing high-speed data is being prepared and an airscrew with blade section of conventional type (Aerofoil 3, R. & M. 322)‡ is being made up for test. The maximum thickness of this section is 10 per cent. of the chord.

* R. & M. 884.—The effects of tip speed on airscrew performance.—By R. McKinnon Wood and G. P. Douglas, R.A.E.

† R. & M. 1086.—Wind tunnel tests with high-speed airscrews. The characteristics of the aerofoil section R.A.F. 31A at high speeds.—By G. P. Douglas and W. G. A. Perring, R.A.F.

‡ R. & M. 322.—Experiments at high speeds on six aerofoils suitable for airscrew design.—By Fage and Collins.

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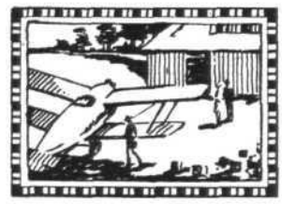
FLIGHT & AIRCRAFT ENGINEER AIRSHIPS

PRIVATE FLYING



A Section of FLIGHT in the Interests of the Private Owner, Owner-Pilot, and Club Member

THE FLYING CLUB OF HARVARD UNIVERSITY

By STEPHEN H. SIME

[This very interesting article is written by a member of the Harvard University Flying Club. It reveals the limited progress of the light aeroplane movement in America where it is not fostered by official assistance as in this country. In spite of this the Harvard Club is obviously successful for not only does it achieve an independent buoyancy, but it is gradually paying off the loan granted it by a generous member in order that it might operate. The author refers to the essential high rates charged to members for flying, but considering the amount of flying averaged per week and other patent circumstances they seem to us to be very reasonable. Also, the fact that they have continued for so long with only one machine available and have entered that for races, too, reflects very satisfactorily on the skill and carefulness of all members.—ED.]

IN view of the individual interest in flying which has led to the formation of Light 'Plane Clubs in England, there may be some who would like to know the circumstances attendant on the activity of the first and as yet the only parallel of these in the United States, the Flying Club of Harvard University. For, although other colleges have flying groups, taking instruction at near-by schools, it has been first at Harvard that undergraduate interest reached the point where students themselves would buy their own 'plane. It may be worthy of further note that outside the colleges and universities nothing more nearly resembling the English Light 'Plane Club has been attempted.

At Harvard, before and immediately following the war, efforts had been made on the part of enthusiastic exponents of aviation to establish an aero club. In 1919 even an inter-collegiate air meet was held between Yale and Harvard war-trained pilots; but the enthusiasm which fostered the race faded with the graduation of its chief cultivators.

The Harvard Flying Club, Inc., was founded in March, 1925, when there were a number of Naval Reserve pilots in the college who were anxious not to lose their wings in the long months from summer to summer. All students interested in aeronautics were called to a meeting; a club was organised; and a constitution drawn up. The purpose of the club as therein set down is to arouse an interest in aviation in Harvard and to own and operate a 'plane for the benefit of its members. Governmental subsidy not being practised in the United States, it remained to find the funds for a 'plane; and for a year and a half after the first meeting the situation was unaltered. Harvard graduates wished the club luck but politely refused to contribute from their pocket-books. The Guggenheim Fund was next approached in the fall of 1926 with no success. Shortly after this venture, however, the proposition of a loan from a member of the club was accepted.

The Travel-Air biplane purchased with the loan is of a type established by many commercial 'plane manufacturers in the United States since 1919. Their two and three-place 'planes have been built around the Curtiss OX5 (90 h.p.) and Curtiss OXX6 (100 h.p.) engines, which were produced in quantity for the military services during the war and of which countless remained in their original packing cases at its close, to be sold at a fraction of their factory cost. These are water-cooled plants and heavy for the power developed, weighing over 4 lbs./h.p.

The next step was to get the 'plane in operating shape and to draw up flight regulations. It was established that all

HARVARD UNIVERSITY FLYING CLUB: (No. 1) Mr. W. N. Bump, President of the Club. (No. 2) The first machine that the members used and owned. It is a Travel-Air biplane. (No. 3) The new Travel-Air biplane fitted with a Curtiss O XX6 (100 h.p.) engine, now used, which was obtained this summer by the members when an opportunity arose of disposing of the old machine advantageously. (No. 4) These two members represent the Harvard Club in air races. They were too modest to send their names.

mechanical work, painting, patching, servicing, etc., was to be performed by students subject to the supervision of the mechanical staff of the Boston Airport from which the club operates. During the winter of 1926–27 the ship was overhauled and in March, 1927, reappeared at the airport ready for flight. The chief pilot, wearing a parachute for purely sentimental reasons, made the test hop and pronounced it O.K. A number of the club pilots tried it out during the remainder of the day.

A system of field managers was appointed, whereby one member of the flight committee, all of whom are pilots, must be on duty every day, to make inspection and oversee the completion of any repairs before the ship leaves the ground. Flying is subject to his approval, and he is empowered to ground anyone at his discretion. Pilots are required to circle the field at an altitude of 1,000 feet before leaving and to make no voluntary landings except home. The intention of the club in drawing up strict rules and establishing a means of enforcing them is to minimize the chances of a major "crack-up" in which passengers might be injured and which would probably wipe the club out of existence.

Conditions and Costs

Since the conditions on which the club had agreed to pay back its borrowed capital called for, in addition to safe operation, rather high rates, the following charges were established; pilot alone pays £2 per hour; pilot and passenger, whether member or guest, £3 per hour. The short autumnal afternoons and the necessary daily inspection, as well as varying fitness of the weather, limit the club's flying hours to an average of ten a week. In making an estimate of the probable cost of operation this average was assumed; and taking into consideration depreciation, minor damages, etc., the estimate arrived at was £1·9 per hour. The surplus or profit was to go, and has gone, toward liquidation of the club's debt. Between March and June, 1927, when with the beginning of the summer holidays the club temporarily suspended its activity, operating costs had proved to be £1·6 per hour; approximately 125 hours were flown, and 300 passengers carried. The field managers stuck to their responsibilities with remarkable seriousness; and the club found its first period of flying absolutely free from mishaps.

During the summer of 1927 the opportunity turned up to dispose of the old plane to advantage and to purchase a new Travel-Air powered by an OXX6 engine. This was done, and on their return to the fall term the club's most experienced pilot and mechanic brought the plane in four hops the 1,500 miles from the factory to the college. A policy of making the club more widely known was inaugurated when it availed itself of the second New England Aero Show to place the new plane on display attended by members of the club to answer questions. Shortly afterward the plane was entered in two races at an air pageant held fifty miles from home, a relaxation of the restrictions of the first year which forbade cross-country flying. Reward in the form of many compliments and £25 prize money was forthcoming. In the first race, a handicap for planes developing 100 h.p. or less, in a field of ten the club plane from scratch placed third; in the second race, for planes of over 100 h.p., in a field of sixteen starting tenth it finished fifth.

The club at present numbers thirty odd members, of whom eight are licensed pilots, some half-a-dozen soloists, and the rest taking instruction. Graduate and undergraduate students are eligible to compete semi-annually for membership: it has been agreed, however, that, while the club has still but one ship, in fairness a limit of fifty members must stand. Mindful of its original purpose, the club holds, as often as possible, open meetings at which a speaker from outside discusses some aspect of aviation, and when it is convenient the opening of competition is made to coincide with one of these meetings. A graduate committee, which is proposed, is expected to aid and enlarge the program of the club for the cultivation of the cause of aviation in the University.

PILOT'S "A" LICENCE

MR. JOHN F. LEEMING, Chairman of the Lancashire Aero Club, has compiled a useful book entitled "Pilot's 'A' Licence" which explains down to the smallest detail exactly what has to be understood and done to pass the tests for the "A" Licence. The necessity for this work has been made clear to him as a result of his experience as an Official Observer on behalf of the Royal Aero Club; in the course of which he has been wearied by answering the same questions so many times each year. No profit is to be made on the sales of the book which can be obtained at the cost price of 1*s.* 6*d.* from Mr. Leeming, Owlpen, Bowdon, Cheshire. There is no doubt about its need and value, for the information that a pupil must obtain is inconveniently scattered about in various publications. In the collective form, as successfully adopted here, it will make the task of future pupils easier, and incidentally cause less bother to Official Observers who supervise their qualifying tests. For the most part Mr. Leeming has transcribed, without alteration, from "The Royal Aero Club Instructions," "The Air Navigation Order 1923," as amended by the Air Navigation (Amendment) Order, 1925, and "Air Navigation (Amendment) Order, 1927," also Notices to Airmen. So the publication is quite authentic.

Tests for the "B" Licence are not dealt with as this is a matter with which the Air Ministry is solely concerned, and does not interest the average club member. In Chapter I, the Licence, the Royal Aero Club Certificate, and the Air Ministry Licence are fully covered. In Chapter II, the author deals with the Technical Examination, setting out all the information necessary to know, and follows this up in the next chapter with the questions. The subject embraces simple definitions of the common types of aircraft, rules on lights carried on aircraft, on signalling, general rules for air traffic and nationality of aircraft, etc. Besides pupils the private owners will find some useful items which have been specially introduced by the author for their benefit. They cover general conditions of flying, registration, certificate of airworthiness, and aerodromes. No light 'plane club should be without copies of this little book, which is very neatly produced, and everyone in the club movement should feel grateful to the author for his industry and foresight. In conclusion we cannot refrain from quoting in full the following gem, which appears as Mr. Leeming's "Acknowledgment" in the front of the book:—

"The writer wishes to thank certain friends without whose advice, criticism, and assistance this book would have been published months ago."

Canadian Club Movement

THE Canadian programme for the development of flying clubs is meeting with enthusiasm, fifteen clubs having already applied for the Government offer of a free aeroplane. To qualify for this gift each club must have 30 members willing to learn to fly. In several centres aerodromes are being established.

D.H. Items

MR. A. G. HAY, of South Africa, inspected his "Moth" at Stag Lane recently. It is called the "Bulawayo" and will be shipped to Durban, then flown from there to Bulawayo by Capt. Mail. After the inspection, Capt. Reeve, one of the de Havilland Company's pilots, tested the machine and then took Mr. Hay and several other passengers for flights.

On November 12, the Rev. Bate, Secretary of the Colonial and Continental Church Society, took delivery of the "Moth" which is to be flown in Australia by the Rev. L. Daniels for covering his huge parish. Mr. G. H. Allison tested this machine in very bumpy weather and then gave a flight to the Rev. Bate's son.

Capt. Florman, of the Swedish Aero Transport, has ordered three "Moths" for Stockholm from the de Havilland Company.

Club Literature

THE Newcastle Aero Club has issued a booklet called "Learn to Fly." It is excellently produced, has a foreword by Sir Sefton Brancker, and sets out full details of the club. Many new members should be the result of this interesting form of propaganda. The work is attractively illustrated whilst the "doped" cover is a neat and apt idea.

Proposed New Clubs

Two organisations which were trying to form an aero club on Tyneside have decided to amalgamate. No difficulty is anticipated in finding a suitable landing ground. They have in view the Marske Aerodrome and also the proposed municipal aerodrome. Dr. Body has been elected president, Mr. N. Sadler, vice-president, and Mr. W. Moss and Mr. F. N. Ogilvie, joint secretaries.

Hull is also striving for the same object. The Blackburn Aeroplane Company, who have their well-equipped aerodrome at Brough, which is situated about ten miles from Hull, have offered the use of it for the future club's activity.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

LIGHT 'PLANE CLUBS

London Aeroplane Club, Stag Lane, Edgware. Sec., H. E. Perrin, 3, Clifford Street, London, W.1.

Bristol and Wessex Aeroplane Club, Yate, Gloucester. Secretary, Lieut.-Col. C. Fleming, Filton Aerodrome, Patchway.

Hampshire Aero Club, Hamble, Southampton. Secretary, Maj. Ross White, Hamble, Southampton.

Lancashire Aero Club, Woodford, Lancs. Secretary, C. J. Wood, Oakfield, Dukinfield, near Manchester.

Midland Aero Club, Castle Bromwich, Birmingham. Secretary, Maj. Gilbert Dennison, 22, Villa Road, Handsworth, Birmingham.

Newcastle-upon-Tyne Aero Club, Cramlington, Northumberland. Secretary, A. H. Bell, c/o The Club.

Norfolk and Norwich Aero. Club, Mousehold, Norwich. Secretary, H. O. Bennett, 5, Opie Street, Norwich.

Nottingham Aero Club, Hucknall, Nottingham. Hon. Secretary, Cecil R. Sands, A.C.A., Imperial Buildings, Victoria Street, Nottingham.

The Scottish Aero Club Movement, 101, St. Vincent Street, Glasgow. Secretary, Harry W. Smith.

Suffolk Aeroplane Club, Ipswich. Secretary, Courtney N. Prentice, "Hazeldell," Stowmarket, Suffolk.

Yorkshire Aeroplane Club, Sherburn-in-Elmet, Yorks. Secretary, D. M. N. Coles, The Aerodrome, Sherburn-in-Elmet.

LONDON AEROPLANE CLUB

REPORT for week ending November 20, 1927.—Flying time, 18 hrs.; dual, 8 hrs. 15 mins.; solo, 9 hrs. 15 mins.; passenger flights, 30 mins.

Dual Instruction.—With Capt. F. G. M. Sparks: A. J. Richardson, H. M. Samuelson, E. R. Andrews, C. M. Green, Miss Spooner.

With Capt. S. L. F. St. Barbe: E. R. Andrews, Rich Hayes, J. A. Simson, H. J. Greenland, Miss Wilson, R. G. Edkins, A. Fowler.

Solo Flying.—R. Sanders-Clarke, W. Roche-Kelly, R. P. Cooper, O. J. Tapper, G. W. Hall, E. C. T. Edwards, H. Solomon J. J. Hofer, Capt. Burt.

Passenger Flights.—With Capt. F. G. M. Sparks, B. Carey, Miss Gaskell.

Aviator's Certificates.—On Wednesday, November 16, Capt. S. J. Burt, Mr. E. C. T. Edwards, and Mr. H. Solomon all passed the qualifying test for aviators' certificates.

BRISTOL & WESSEX AEROPLANE CLUB

REPORT for week ending November 19.—Flying time, 23 hrs. 30 mins.: instruction, 8 hrs. 55 mins.; solo, 9 hrs.; passenger, 5 hrs. 35 mins.

Instruction (with Mr. E. B. W. Bartlett).—Messrs. A. E. Arnold, M. L. Alexander, T. H. Clarke, C. R. Greenhill.

Soloists, under instruction: Messrs. Hon. H. C. H. Bathurst, C. H. Brewer, A. H. Downes-Shaw, R. A. Hall, J. H. Robert, C. E. Pitman, S. K. Jopp.

Passengers, with Mr. Tratman: Miss Castle, Miss Neuth, Messrs. G. Pitman Wallace, Sly.

Passengers, with Mr. Bartlett: Messrs. Hon. H. C. H. Bathurst and Triepland.

Messrs. Brewer and Roberts carried out their first solo flights. All the flying was carried out during the early part of the week, and everything pointed to a record in flying hours. We were, however, doomed to disappointment by bad weather on Friday and Saturday.

The club offer their congratulations to Capt. McIntosh (member) and to Mr. Bert Hinkler on their splendid performance, and sympathise with them in that they were prevented from reaching their objective; also to our friends on the other side of the aerodrome on the fine performance of the Jupiter engine under such trying conditions of snow and sleet.

LANCASHIRE AERO CLUB

REPORT for week ending November 19.—Flying time, 11 hrs. 15 mins.; instruction, 6 hrs. 45 mins.; solo flights, 2 hrs. 40 mins.; passenger flights, 1 hr. 15 mins.; tests, 1 hr. 15 mins.

Instruction.—With Mr. Brown: Messrs. Slater, Hall, Heath, Tweedale, Gort, Davidson, Riley, Allott, Miss Brown and Miss Baerlein. With Mr. Cantrill: Mr. Browning. With Mr. Scholes: Mr. Fallon.

Soloists (under instruction).—Mr. Gerrard.

Pilots.—Messrs. Costa, Gattrell and Rowley.

Passengers.—With Mr. Goodfellow: Messrs. Mills and Jennison. With Mr. Cantrill: Mr. Ramsden. With Mr. Scholes: Miss Knott. With Mr. Lacavo: Mr. Hartley. With Mr. Gattrell: Mrs. Thorpe.

In a week of outstanding beastliness in the matter of weather the only point of flying interest was that Mr. Costa joined Mr. Twemlow in completing his 20 hrs. as an "A" licence pilot this (Air Ministry agreement) year.

On the ground, however, even Mr. Caldecott's quiet composure has been shaken by the long-promised-and-almost-despaired-of publicaton of "Pilots' 'A' Licence," by J. F. Leeming. One can pay this little volume no higher compliment than to compare it with "How to Fly," written by Monsieur Voisin many years ago. One read the latter at the age of 10 or so, and laid it down, feeling that if only an aeroplane were handy one would take it up at once. Even so, with Mr. Leeming's book—after reading it one feels ready to re-qualify for his "A" licence almost, if ever such a horrible necessity should arise!

MIDLAND AERO CLUB LIMITED

REPORT for week ending November 12.—Total Flying time, 12 hrs. 22 mins. Dual instruction (with Mr. McDonough):—N. Crane, W. Lane, J. Brewin, E. Darlington, H. Duckitt, G. Robson.

Solo:—R. Bednell, E. J. Brighton, R. L. Jackson, H. J. Willis, H. H. Smith, G. G. Savage, J. Brinton.

Passengers (with Mr. Jackson):—H. J. Wynn. (With Mr. Brighton):—Mr. Katri.

Report for week ending November 19.—Total flying time, 10 hrs. 15 mins. Dual instruction (with Mr. McDonough):—J. Brewin, H. Lattey, R. Darlington, G. Robson, G. Brinton, A. Ellison, S. Duckitt.

Solo:—C. Fellowes, W. Swann, E. J. Brighton, G. Brinton, E. King.

NEWCASTLE-UPON-TYNE AERO CLUB

REPORT for week ending November 20.—Flying time, 8 hrs. Instruction, 3 hrs. 45 mins.; soloists, 1 hr. 20 mins.; "A" pilots, 30 mins.; passengers, 2 hrs. 25 mins.

Instruction (with Mr. Parkinson):—Miss Rambaut, Messrs. Irving, Griffiths, Horn, L. W. Heaton, R. J. Dickinson, Phillips and Dr. Alderson.

Soloists:—Mr. J. S. Robertson. "A" Pilots:—Mr. D. Wilson.

Passengers (with Mr. Parkinson):—Mrs. Rambaut, Mr. Murrell and Capt. Lamplugh.

Mr. J. S. Robertson attempted his height tests on Tuesday. He left the ground in reasonably good weather, but before he had reached 5,000 ft. a bank of mist suddenly blotted out the landscape. He very wisely followed a gap in the mist and came down low. Being unable to distinguish anything he could see, he landed in a field to enquire his whereabouts and learnt that he was some 25 miles from Cramlington. He took off and reached Cramlington safely. He completed the tests very successfully on Wednesday.

LX. was rather badly damaged by fire while in the hangar on Thursday, so only one machine will be on service for a time.

Capt. Lamplugh, who visited the aerodrome on Saturday in connection with this mishap, flew to Sherburn with Mr. Parkinson after carrying out his Inspection.

The Club Dance, held on Friday, proved to be a complete social success, and the balance sheet will be on the right side.

NORFOLK & NORWICH AERO CLUB

REPORT for week ending November 20.—Total flying time, 3 hrs. 30 mins.

Under instruction with Capt. Lines:—Messrs. G. F. Surtees, J. Morse, R. Potter and H. Mack.

Soloists:—W. P. Cubitt, and F. Gough.

Passengers:—A. Bagshaw.

Persistent bad weather has brought flying to a complete standstill.

NOTTINGHAM AERO CLUB

REPORT for fortnight ending November 18:—

The club commenced its aerial activities on November 4, 1927, on the return of their pilot instructor, Mr. Bernard Martin, from the Instructor's Course at C.F.S., and the appointment of Mr. A. J. Harris as ground engineer completed the personnel.

We are fortunate in numbering amongst our present officers the following well-known personalities to whose generosity the club owes much.—President: Sir Harold Bowden, Bt.; Life Vice-Presidents: Sir Albert Ball, J.P., Lieut.-Col. R. Leslie Birkin, D.S.O.; Vice-Presidents: Sir Jesse Boot, Bt., Julian Cahn, Esq., M.F.H. and Joseph Caldwell, Esq.

Flying Time.—Total flying time, 21 hrs. Dual: 17 hrs. 30 mins. Solo: 2 hrs. 50 mins. Passengers: 40 mins.

Instruction (with Mr. B. Martin).—Messrs. C. E. Cox, H. A. Hallam, A. G. Callidine, H. S. Whitby, E. B. Glenn, C. H. Sands, R. A. Balke, G. W. Meats, L. E. Weldon and W. B. Pilgrim.

Soloists.—Messrs A. C. Ball ("A" licence) and H. A. Hallam.

Passenger Flight.—(With Mr. B. Martin): Mrs. H. A. Hallam, Messrs. E. J. Kay and B. R. Wilkinson. With Mr. A. C. Ball: Mr. R. A. Blake.

The weather has been kind to us on most days and our Moth S.K. has been busy. On Thursday, November 17, the club's first soloist, Mr. H. A. Hallam, was launched and put up a successful show, leaving S.K. still in commission, and with a little fine weather next week we hope to see another couple or so pushed off.

Visitors.—On Thursday, November 10.—Sir Sefton Brancker, with Capt. Paget and a Westland Widgeon, paid us a short visit on their way to Leeds. They were met in the air by Mr. A. C. Ball (our one and only "A" pilot) with Mr. R. A. Blake as passenger.

Aerodrome.—Our aerodrome by the way, is the old war-time one at Hucknall about 6 miles north of Nottingham and is safe all over (Phone Hucknall 158).

Our clubhouse accommodation is, at the moment, more spacious than luxurious and we have not got a bar (yet), but we shall be delighted to extend to any visitors a warm welcome.

Nottingham Headquarters.—It should be noted that correspondence should be directed to the honorary secretary, Cecil R. Sands, A.C.A., at Imperial Buildings, Victoria Street, Nottingham. Telegrams may be sent to the aerodrome or to Sands, Services, Nottingham.

SUFFOLK AEROPLANE CLUB

REPORT for week ending November 13.—Flying time, 6 hrs. 50 mins.

Instruction with Mr. Lowdell: Miss D. Creasy, Dr. Sleigh, N. Creasy, S. Schofield, R. Brown, T. Marriage, K. Peck, H. Billinton.

Passengers with Mr. Lowdell: Miss Capel, Mr. Gosling, Miss Hanson, Miss Prentice.

Passengers with Mr. C. N. Prentice: Miss Simpson, Miss Fison, Miss King, Mr. Clifton.

Solo: S. Schofield, N. Creasy, C. N. Prentice.

Our President, the Hon. Lady Bailey, paid us her usual Sunday visit, and gave joy rides to several of the members. Great excitement prevailed at the aerodrome on Saturday when it was officially announced that the Suffolk Club was to be included in the new subsidy scheme. So far we have had a very struggling existence, and we can now look forward to a brighter future. We hope soon to secure a second machine and turn out "A" licensed pilots in mass production.

REPORT for week ending November 20.—Flying time, 3 hrs. 45 mins.; Instruction.—With Mr. Lowdell: Miss S. Edwards, Dr. Sleigh, H. Billington, S. Schofield, G. Hutley, K. Peck, R. Brown.

Passengers.—With Mr. Lowdell: F. Jolly, C. Hanson. With Mr. C. N. Prentice: Mrs. Courtney Prentice.

Soloists.—Dr. Jas. Sleigh, Mr. S. Schofield, C. N. Pentice.

Dr. Jas. Sleigh, our chairman, was launched solo this week and put up an excellent show.

Lady Bailey again visited us on Sunday. The weather was appalling, thick fog and rain, it was impossible for her to fly down so she very sportingly came by road.

Weather conditions this week have been absolutely dud, hence our few flying hours, typical East Coast weather, gales, rain, fog, wind, sleet, and snow.

Great Flying-Boat Cruise

LEAVING Henjam Island, on the Persian Gulf, on November 16 at 3.30 a.m., the R.A.F. Supermarine-Napier "Southampton" flying-boats reached Gwadur, Baluchistan, at 2.30 p.m. the same day. On November 18 they went on to Karachi, where local R.A.F. machines escorted them. The landing was made in the harbour, and Group-Capt. H. M. Cave-Browne-Cave, who is commanding the cruise, went ashore with the other officers in launches. They were welcomed by Wing-Commander R. J. Bone, commanding the Aircraft Dept., the Adjutant, and most of the local Air Force officers.

The Far East Flight

WHILST attempting to create a record non-stop flight to India in their Fokker monoplane (Bristol "Jupiter"), Capt. McIntosh and Mr. Bert Hinkler landed at Bialokrynica, near Podhajce, in Eastern Galicia, after leaving Upavon, Wilts. The start was made on November 15, and the first landing was apparently made the next day, November 16. Two days later they took off again, but were forced to descend at Mszsana, near Grodek, about 75 miles away. The two pilots are now staying at Lemberg, and their future plans are uncertain, as their machine, the "Princess Xenia," was damaged during the second landing. It is reported, however, that they will fly the machine to Amsterdam, where it will be overhauled. They have informed the Bristol Aeroplane Company that bad weather was the entire cause of their failure, and the "Jupiter" had given no trouble whatever. Although a failure, this flight must be recorded as yet another demonstration of magnificent endurance, not only on the part of the British pilots but of the British engine as well.

London—Cape Town Flight

MR. JOHN CARBERRY left Croydon in his Fokker monoplane on November 18 for Cape Town. He was accompanied by a mechanic and hopes to make the flight in record time. Owing to fog he was forced to land at Tournus, 60 miles north of Lyons, at 4 p.m. the same day. On November 19, Marignane Aerodrome, Marseilles, was reached at 1 p.m., It is the intention of Mr. Carberry to continue this flight to his estates in the Kenya Colony after reaching the Cape.

The "Red Rose" in Sick Bay

IT is reported now that Capt. Lancaster and Mrs. Keith Miller have been detained at Basra for a week's quarantine owing to an outbreak of cholera in the district. They are attempting to fly to Australia in an Avro-Cirrus "Avian."

U.S. Ban on Air Development in the Panama

AN American report implies the refusal of America to permit foreign air companies establishing landing bases in the Panama zone. An air line is already operating successfully between the coast of Colombia and Bogota under the control of a German aviation company. Further extensions in the Canal zone are desired by this company in co-operation with another.

San Francisco–New Zealand Flight Starts

CAPT. F. GILES, a British pilot, left San Francisco for Wellington, New Zealand, in a Hess "Bluebird"-biplane on November 19, but returned 45 minutes later owing to fog. A second start was, however, made early on November 22. He plans to accomplish this 11,000-mile flight in four stages in the following order: San Francisco–Honolulu–Brisbane–Sydney and Wellington. The financial support is provided by a Detroit business man, and the actual start was made from Detroit without the usual preliminary trials of the machine owing to delay in constructing it. A forced landing followed in an Indiana cornfield.

Balloon Record Decision

THE balloon ascent to 42,470 ft. by Capt. Hawthorne Gray, U.S. Army, on November 5, has been reported as a "record" by the U.S. National Aeronautic Association. It must, however, be recognised by the Féderation Aéronautique Internationale before it becomes valid. It will be remembered that Capt. Gray lost his life in making this attempt.

Yet Another!

PRESIDENT COOLIDGE has presented Col. Lindbergh with the Hubbard Medal of the National Geographic Society Col. Lindbergh has also been made president of a new organisation named "International Trans-Oceanic Pilots' Association."

Faked Records Echo

M. CALLIZO, the French pilot, has appeared before a court of inquiry of the Legion of Honour, of which he became a member after a "record" flight in 1924. He declared that this "record" was genuine. It will be decided whether he shall be expelled from the Order.

R.A.F. Speed Record Attempt

FLIGHT.-LIEUT. S. N. Webster will attempt to create a new speed record in the Supermarine-Napier S5 after Christmas at Calshot.

Naval Regrets

ADMIRAL SIR R. F. PHILLIMORE read a paper at the Royal United Service Institution on November 16, and said that when some of them read of the flying-boat cruise to Australia they felt that there was another service doing what was plainly the Navy's work. It was no use regretting the lamentable lack of vision that allowed the Naval Air Service to be abolished. They had to work to get it back, remarked the Admiral.

Napier's Valuable Gift

THE University Air Squadrons were presented with two Napier engines for instructional purposes on November 18 at Oxford by Mr. H. T. Vane and Sir Harry Brittain, representing Napier and Son, Ltd. Sir Hugh Trenchard, Air Vice-Marshal Sir Ivo Vesey, and Col. the Hon. M. C. A. Drummond were present on behalf of the Air Ministry.

A Canadian Air Mail Service

IT is reported that the Canadian Post Office Department has just concluded a contract with the Transcontinental Airways, Ltd., for a weekly air mail service this winter connecting the remote places on the north shores of the St. Lawrence, Anticosti, and Magdalene Islands.

Swedish Air Mails

THE air mail service of the Swedish Aerotransport Co. on the Malmö–Amsterdam–Paris–London, Malmo–Berlin, and Stockholm–Berlin lines have now stopped for the season. During the past season 141 regular trips have been made, out of which only five have fallen short of the schedule owing to unfavourable weather conditions.

Schneider Race, 1928

DURING the last week-end the representatives of the Royal Aero Club visited Blackpool, Southport, and Morecambe with a view to exploring the possibilities of a course for the race for the Schneider Trophy next year. At each of these towns the Club's representatives were received by the mayor and members of council, and the proposals discussed will be considered later by the Royal Aero Club.

Model Airships

APROPOS the announcement in last week's FLIGHT regarding model airships, this has roused considerable interest in several quarters, and we shall have something further to say on the matter in our next issue.

Paris-Buenos Aires Air Line

THE Latécoère Air Co. have commenced the Southern section of the air connection between Paris and Buenos Aires. Mail aeroplanes have made journeys between Rio de Janeiro and Buenos Aires. This distance is bridged over a period of two days, the departure on the first day being followed by the arrival on the next day. By boat the journey takes five days. The seaplanes which will be used across the Southern Atlantic section of this long air line between the two continents were delivered to the company recently, and will be sent to Saint-Louis, Senegal, immediately. By the middle of January the complete service is expected to be in operation.

German Atlantic Flight Progress

THE German seaplane D.1230 (Junker's) attempted to leave the Azores on November 22 for the next stage of the Atlantic flight to Newfoundland. A report was received later that it was being towed back.

FLIGHT
AIRCRAFT ENGINEER AIRSHIPS

THE ROYAL AIR FORCE

London Gazette, November 15, 1927.

General Duties Branch

J. E. M. Bainbridge (late Sec. Lt., Royal Corps of Signals) is granted a permanent commn. in rank of Pilot Officer (Nov. 1); L. L. King is granted a short service commn. in rank of Flying Officer (Oct. 17). The following Pilot Officers are promoted to rank of Flying Officers:—C. S. Cadell (March 18); H. C. Johnson (July 16); W. M. Phillips (July 16); N. C. Ross-Roberts (Sept. 13).

Squadron-Leader A. P. Maurice, D.F.C., is placed on the half-pay list, Scale B (March 23, to 31, inclusive). The following are seconded for duty with the Royal Australian Air Force (Nov. 12):—Wing Commander M. Spicer; Squadron-Leader H. G. Smart, O.B.E., D.F.C., A.F.C.; Squadron-Leader T. F. W. Thompson, D.F.C.

Flying Officer A. T. E. Witt, M.B.E., is placed on the retired list at his own request (Nov. 12); Flying Officer C. Lloyd (Lieut., The Buffs) relinquishes his temp. commn. on completion of duty with R.A.F. (Nov. 13); the short service commn. of Pilot Officer on Probation E. J. Martin is terminated on cessation of duty (Nov. 11).

Stores Branch

The following Pilot Officers on probation are confirmed in rank and promoted to rank of Flying Officer (Oct. 9):—M. S. Shapcott, C. I. Fry, W. A. Stagg. Flight-Lt. G. T. Stroud, M.B.E., is placed on retired list (Nov. 13).

Memorandum

Lt. H. L. MacDonald is deprived of permission to retain rank on conviction by the Civil Power (Sept. 2).

RESERVE OF AIR FORCE OFFICERS

General Duties Branch

The following Flight-Lieuts. are employed with the Regular Air Force for a period of two years (Nov. 1):—M. Ballard, A. E. Woodbridge. The following Flying Officers are transferred from Class A to Class C:—H. A. Bayne (Sept. 5); H. V. Michell (Nov. 15). Pilot Officer J. P. James is transferred from Class BB to Class C (March 5); Flight-Lieut. E. W. Simpson ceases to be employed with the Regular Air Force (Sept. 5). The following relinquish their commns. on completion of service:—Flight-Lieut. W. R. G. Atkins, O.B.E. (Sept. 18); Flying Officer I. C. G. Simpson (Sept. 28).

Special Reserve

The commission of Pilot Officer on Probation R. B. Mitchell is terminated on cessation of duty (Oct. 10).

ROYAL AIR FORCE INTELLIGENCE

Appointments.—The following appointments in the Royal Air Force are notified:—

General Duties Branch

Squadron Leaders: W. D. Budgen to Fighting Area H.Q., Uxbridge, 14.11.27. R. S. Maxwell, M.C., D.F.C., to No. 70 Sqdn., Iraq, 1.11.27. R. Collishaw, D.S.O., O.B.E., D.S.C., D.F.C., to H.Q., Air Defence of Great Britain, Uxbridge, 18.11.27.

Flight Lieutenants: J. D. S. Denholm to H.Q., Air Defence of Great Britain, Uxbridge, 7.11.27. W. V. Simons to R.A.F. Base, Malta, 15.10.27.

Flying Officers: A. L. Macmillan to H.M.S. "Hermes," 4.11.27. P. E. Grenfell to No. 13 Sqdn., Andover, 1.11.27. H. M. Schofield to R.A.F. Station, Upper Heyford, 23.11.27. R. Barrett to R.A.F. Depot, Uxbridge, 21.11.27. T. A. Hale-Munro to No. 111 Sqdn., Duxford, 7.11.27. N. A. West to Armoured Car Wing, Iraq, 1.11.27. L. C. Barling to No. 111 Sqdn., Duxford, 21.11.27. C. H. Roberts to R.A.F. Depot, Uxbridge, 15.11.27.

Pilot Officers: L. S. Tindall to No. 2 Flying Training Sch., Digby, 7.11.27. M. Griffiths to No. 26 Sqdn., Catterick, 10.11.27. W. M. Moore to No. 26 Sqdn., Catterick, 8.11.27. P. C. Fair to No. 1 Flying Training Sch., Netheravon, on appointment to a Permanent Commission, 15.11.27.

Stores Branch

Flying Officer H. N. Davies to No. 55 Sqdn., Iraq, instead of to No. 6 Sqdn. as previously notified, 14.10.27.

Accountant Branch

Flying Officer F. J. S. Short to Wireless Station, Ismailia, 27.10.27.

Medical Branch

Squadron Leaders: J. Rothwell, M.B., and D. G. Boddie, M.B., to R.A.F. Combined Hospital, Iraq, 13.10.27 W. G. L. Wambeek to Station H.Q., Hinaidi, 15.10.27.

Flight Lieutenant B. Pollard to R.A.F. Depot, Uxbridge, 21.1.28.

Flying Officers: G. E. Church, M.B., and P. H. Perkins, to R.A.F. Combined Hospital, Iraq, 13.10.27. R. A. W. Kerr, M.B., and E. J. T. McWeeney, M.B., to R.A.F. General Hospital, Iraq, 15.10.27. R. Thorpe to Station H.Q., Hinaidi, 15.10.27.

Flying Officers: V. V. Brown, M. Clancy, W. Heron, F. E. Lipscomb, J. F. McGovern, C. P. O'Toole, S. B. S. Smith, G. H. Williams, and D. A. Wilson, to Research Lab. and Medical Officers' Sch. of Instruction on appointment to Short Service Commissions, 15.11.27.

IN PARLIAMENT

The "Hermes"

MR. WELLOCK, on November 16, asked the First Lord of the Admiralty whether the aircraft-carrier *Hermes* has now been withdrawn from Chinese waters; how long she was stationed in China; how many flights were made over Chinese territory from her decks during her stay in China; and for what purpose these flights were made?

Mr. Bridgeman: The *Hermes* has returned to England to refit and recommission, and will return to the China Station on completion, probably in January.

She was on the China Station from August, 1925, to February, 1926, and from October, 1926, to September, 1927.

As regards the remainder of the question, flights over Chinese territory were made on nine occasions, eight of which were in connection with Chinese piratical activities or attacks on merchant ships.

Aircraft Carriers

LIEUT.-COMMANDER KENWORTHY asked the First Lord of the Admiralty whether the new battleships, *Nelson* and *Rodney*, and the new county class cruisers carry aircraft or are to carry them?

Mr. Bridgeman: These ships do not at present carry aircraft, but will be fitted with catapults later. *Nelson* and *Rodney* will each carry two aircraft and the county class cruisers one aircraft each.

Airship Construction

MR. HARDIE asked the Secretary of State for Air whether he can now report upon the work completed in connection with the construction of the airship at Cardington?

Sir S. Hoare: Work on the R.101 at Cardington is steadily proceeding, and satisfactory progress is being made. The manufacture of the gasbags, control car and instruments, power cars, passenger and crew accommodation, miscellaneous girder work and fuel system is approximately two-thirds complete. There has been some delay in obtaining deliveries of certain special materials for the hull structure, but these have now been surmounted and assembly of the transverse frames has begun.

Mr. Rose asked what will be the estimated total cost of the Cardington airship when launched next autumn; and how much in excess of the original estimate the total cost will be? Mr. Hardie asked what the Cardington airship will cost in excess of the amount originally asked for in May, 1924, and granted by the House at that date?

Sir S. Hoare: The total sum provided in the original estimate for the construction of the R.101 may be put at approximately £300,000. The latest estimate indicates that owing to a variety of causes, including the slowing down of the programme, this sum is likely to be exceeded by about £100,000.

Mr. Rose asked whether the cost of altering and enlarging the air-shed at Howden is included in, or in addition to, the fixed contract price of £350,000 payable to the Airship Guarantee Company, Limited?

Sir S. Hoare: The contract with the Airship Guarantee Company, Limited, provides for a payment of £300,000 for the airship, complete in all respects, and of £50,000 as a capital contribution towards the company's capital expenditure on shed, plant, etc., necessary for the execution of the contract. Any alterations and enlargements of the shed other than those which the above contribution would cover are matters for the company.

Mr. Rose asked what will be the cost of the airship now under construction at Howden when launched next autumn; and how much in excess of the contract price, £350,000, the total cost is estimated to be?

Sir S. Hoare: The contract price for the airship has not been modified and remains as originally fixed at £350,000.

Mr. Hardie asked for an estimate of the sum in excess of the £1,200,000, which was to cover the cost of the two great airships now under construction at Howden and Cardington, respectively, which will be necessary by next autumn, when the ships are to be ready for service?

Sir S. Hoare: The cost of the scheme of airship development, of which the construction of the two airships formed only a part, was originally estimated at £1,350,000, less a possible repayment of £150,000. It is now estimated that, when the programme originally proposed is completed, there will be an excess in respect of the items it comprises as a whole of, approximately, £330,000. I may add that this excess is due to a variety of causes, including the spread of the work over a longer period than that originally contemplated.

Imperial Airways, Limited, Subsidy

COMMANDER BELLAIRS asked the cost to the Government by reason of the subsidy for each person carried to the Continent by Imperial Airways?

Sir S. Hoare: The aircraft operated by Imperial Airways, Limited, carry both passengers and goods, and it is not possible, therefore, to separate the cost to the State of these two classes of freight.

Commander Bellairs asked what is the approximate cost to the State by reason of the subsidy for every mile flown by a civil aviation machine in the subsidised Imperial Airway Service?

Sir S. Hoare: In 1926 the aircraft operated by Imperial Airways, Limited, flew 732,980 miles on the European subsidised services. During that year the subsidy was at the rate of £137,000 per annum, and therefore the cost to the State per mile flown was, approximately, 3s. 9d.

Sale of Intoxicating Liquors on Aeroplanes

COLONEL DAY asked the Financial Secretary to the Treasury whether he will consider the introduction of legislation making provision for the sale of intoxicating liquors in aeroplanes flying over British territory, as at present exists on trains and ships during the hours when licensed houses are closed?

Mr. Samuel: The proposal, besides involving amendment of the licensing law, would necessitate the creation of a new Excise Licence Duty. The matter will receive consideration before the next Finance Bill.

Air Services

LIEUT.-COMMANDER KENWORTHY, on November 17, asked the Secretary of State for Air (1) what progress had been made with the extension of the air mail service to Australia and from Cairo to Cape Town; (2) whether agreement has now been reached with the Persian Government to permit British aeroplanes to fly over Persian territory on passage between Cairo and Karachi?

Sir S. Hoare: The service between Cairo and Basra continues to be operated once a week in each direction with 100 per cent. efficiency. As regards the Basra-Karachi section, the Persian Government have not yet agreed to the operation of the route along the shores of the Persian Gulf. As regards the extension beyond Karachi, the Government of India are commencing the organisation of the main route across India from Karachi to Calcutta, and the Royal Air Force have carried out a survey of the route from Calcutta to Rangoon and Singapore. As regards the Cairo-Cape Town service, the experimental service between Khartoum and Kisumu has been interrupted by another mishap to the machine employed, but further experimental flights over the route will be carried out shortly by Sir Alan Cobham during the tour which he is about to make for the purpose of personally negotiating for the extension southwards of this route and the establishment of an air service in South Africa. The question of the provision of the subsidy necessary for the establishment of the Khartoum-Kisumu air service on a permanent basis was considered at the recent Colonial Office Conference and has been taken up with the Governments concerned.

INTERNATIONAL AERONAUTICAL EXHIBITION, BERLIN, 1928

THE International Aircraft Exhibition, known as "I.L.A. 1928," which is being organised at Berlin by the "Reichsverband der Deutschen Luftfahrt-Industrie" in collaboration with the Berlin Trade Fair Authorities, will be held from October 7 to 28, 1928, at the Exhibition Buildings, Kaiserdam, Berlin-Charlottenburg.

The organisers will be glad to hear from any British firms and other bodies who may be interested. Letters should be addressed: Reichsverband der Deutschen Luftfahrt-Industrie, W.35, Blumeshof 17, Berlin.

The Exhibition will be divided into the following groups:—

Group I, Aircraft Industry.—(*a*) *Aircraft.* 1, Aircraft of all descriptions. 2, Aircraft Motors. 3, Airship Models. 4, Processes of Manufacture (in special stands). 5, Balloons.

(*b*) *Parts and Equipment.* 1, Propellers. 2, Instruments and Measuring Apparatus. 3, Wireless Telephony and Telegraphy. 4, Wireless Sets. 5, Aerial Photography (Instruments). 6, Parachutes. 7, Wheels for Aircraft. 8, Tyres. 9, Miscellaneous.

(*c*) *Raw Material, Semi-manufactures, Fuel.* 1, Metals. 2, Wood. 3, Fuel. 4, Various (Cloth, Paints, and Varnishes).

(*d*) *Machinery, Tools.*

Group II, Aerial Traffic.—(*a*) Statistics on World Aerial Traffic. (*b*) German Aerial Traffic. (*c*) Aerial Goods and Passenger Services. (*d*) Aerial Post. (*e*) Aerial Photography and Surveying. (*f*) Ground Organisation of Aerial Traffic (Aerodromes, Equipment and Apparatus for maintaining services inside and outside aerodromes).

Group III, Aerial Pilots.—(*a*) Training for Sporting Purposes. (*b*) Training for Traffic Pilots (by land and sea). (*c*) Equipment and Dress.

Group IV, Science and Literature (Testing Processes).—Research, Experiment, Testing of Materials.

Group V, Historical Department.

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AIR MINISTRY NOTICES

NOTICES TO AIRMEN

Flights to Spain

1. APPLICATIONS for permission to fly over Spain should in future be made, as long in advance as possible, to the Secretary (C.A.1), Air Ministry, Gwydyr House, Whitehall, S.W.1. As a permit, which must be carried in the aircraft, has to be obtained from the Spanish Government in each case, sufficient time must be allowed for this to be done. Applications should state:—

Machine: type, engine, registration mark.
Names of pilot and other members of crew.
Names of passengers (if any).
Nature and weight of cargo and equipment.
Proposed route.
Date and place of arrival in Spain.
Date and place of departure from Spain.
Object of flight.
Whether W/T will be carried.

2. Before flying to Spain pilots should also acquaint themselves with the regulations in force in that country, particulars of which may be obtained at the above address. Information regarding the customs, aerodromes and prohibited areas in Spain is given in Notices to Airmen Nos. 52 of 1920, 85 of 1921, and 30 of 1923.

3. *Cancellation.*—Notice to Airmen No. 70 of 1920 is cancelled. (No. 84 of 1927.)

NOTICE TO GROUND ENGINEERS

Avro 504N "Lynx": Modifications Nos. 8 and 12

1. THE modifications described herein must be embodied in Avro 504N "LYNX" aircraft before any such aircraft is submitted for re-inspection for renewal of Certificate of Airworthiness.

2. *Modification No.* 8.—The existing type of air intake, where used in conjunction with an exhaust ring, is unsuitable owing to the openings being opposite joints in the exhaust ring. If the aircraft is fitted with an exhaust ring, the air intakes must be replaced and the carburettor shield altered in accordance with the above modification.

3. *Modification No.* 12.—The oil breather pipe is no longer to be connected to the air intake, but is now to be clipped to the fireproof bulkhead and led through the cowling near the bottom of the fuselage.

4. No Certificate of Airworthiness will be issued or renewed in respect of any aircraft, unless the above modifications have been embodied.

5. Drawings of these modifications can be obtained on application to the Drawings Library, Air Ministry, Kingsway, W.C.2, on prepayment.

No. 7 of 1927.

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PERSONALS

Married

CAPTAIN ERIC RENN DAVIS, late R.A.F., younger son of the late E. H. Davis, Esq., of Birr, Ireland, and of Mrs. Davis, Wadhurst, Sussex, was married on November 5, at the English Church, Nakura, Kenya Colony, to NORAH ALEXANDRINA, youngest daughter of LT.-COL. D. A. BINGHAM, D.S.O., of Devizes, Wilts.

To be Married

The engagement is announced between CAPT. CHARLES F. M. CHAMBERS, D.S.C., late R.N.A.S., elder son of the late Capt. Chambers and Mrs. Chambers, of Rolvenden, Kent, and MARY BARBARA, elder daughter of Mr. W. LINCOLNE SUTTON, F.I.C., of Eaton, Norwich.

A marriage has been arranged, and will take place shortly, between IVAN G. C. PEACOCKE, R.A.F., elder son of the Ven. the Archdeacon of Kildare and Mrs. Peacocke, of Kill, Co. Kildare, Ireland, and PHYLLIS, youngest daughter of LIEUTENANT-COLONEL PUECH, C.I.E., O.B.E., and Mrs. PUECH of Wimbledon, and Meerut.

THE engagement is announced of EDWARD WEST UNMACK, D.F.C., elder son of the Rev. E. C. Unmack, D.D., and Mrs. Unmack, of West Horsley, Surrey, to ALICE MARIAN, only daughter of Mr. and Mrs. C. WALTER JONES, Ellesmere House, Eccles.

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THE WESTLAND AIRCRAFT SOCIETY

(The Yeovil Branch of the R.Ae.S. and Inst.Ae.E.)

THE above society, of which Mr. R. A. Bruce, Managing Director of Westland Aircraft Works is President, has now been in existence for just over one year, and during the last winter session 27 lectures were delivered, many of them being of such interest that they were reproduced and sold to members and other aircraft engineers at home and abroad. Several of the lectures were also printed in the Journal of the Royal Aeronautical Society.

For the coming session lectures have been arranged to be held at approximately weekly intervals. As the society has for one of its objects the furtherance of "airmindedness" amongst the general public, non-members may be admitted on payment of the annual subscription of 5*s*.

The first of these lectures were given on November 2 by Mr. H. A. Drane (Messrs. Alfred Herberts), the subject being "A Brief History of the Turret Lathe," and on November 18.—"The Water-cooled Aero Engine." A. A. Rubbra, Esq. (Rolls-Royce, Limited). The following is a list of the forthcoming fixtures:—

November 23.—"A European Tour in a Widgeon." Sqdn.-Ldr. Hon. R. A. Cochrane.

December 9.—"Airscrews." W. E. Park, Esq. (The Airscrew Co.).

December 13 and 14.—A film will be shown on these dates at the Central Cinema entitled "The Persian Oil Industry." This film is about 3,000 ft. in length, and is of considerable interest. It is being shown by courtesy of the Anglo-Persian Oil Co., and special reserved seats are being arranged for those members of the society who desire to attend.

January 6, 1928.—"Some Experiences with Aircraft in the Near East." Sqdn.-Ldr. H. M. Probyn.

January (dates to be fixed later).—"Sir Henry Bessemer and his Work." R. J. Norton (Director of Petters, Ltd.).

"Modern Developments in Aircraft Instruments." Maj. C. J. Stewart.

"The Schneider Cup Race of 1927." Flight-Lieut. C. N. Webster.

"Drilling for Oil and the Production of Petrol." St. John Plevins (Representative of the Anglo-American Oil Co.).

February.—"Performance Testing of Aircraft." H. L. Stevens (C.T. O. of A. & A.E.E., Martlesham Heath).

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PUBLICATIONS RECEIVED

Hand-Book of the National Aircraft Collection Exhibited in the United States National Museum. The Smithsonian Institution, Washington, D.C., U.S.A. *Welding Cast Iron.* Suffolk Iron Foundry (1920), Ltd., Stowmarket.

Catalogues

G.E.C. Lighting for Shops, Stores, etc. The General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.

The House of Sampson Low: Autumn, 1927. Sampson Low, Marston and Co., Ltd., 100, Southwark Street, London, S.E.1.

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AERONAUTICAL PATENT SPECIFICATIONS

(*Abbreviations*: Cyl. = cylinder; i.c. = internal combustion; m. = motor. The numbers in brackets are those under which the Specifications will be printed and abridged, etc.)

APPLIED FOR IN 1926

Published November 24, 1927

18,560. S. D. SCOTT. Automatic release of pyrotechnics from aircraft. (279,539.)
19,013. L. L. KAHN. Girders used as aircraft wings. (258,841.)
31,124. T. B. RINGWOOD. Screw propellers. (279,664.)

APPLIED FOR IN 1927

Published November 24, 1927

1,614. H. JUNKERS. Methods of and apparatus for determining the direction and velocity of flight in relation to the ground, the velocity and direction of the wind, and the angle of drift for the time being, from an aircraft in flight. (264,843.)
14,928. A. ROHRBACH. Hollow aeroplane wings. (272,231.)
16,369. E. ZASCHKA. Helicopters. (272,962.)
16,870. ROHRBACH METALL-FLUGZEUGBAU GES. Means for releasing and discharging loads from aircraft. (273,325.)

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